The
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"The Very Devil!"

NO! anxious reader—these are *not* our own words. But they are very expressive, and in the circumstances attending their utterance they speak volumes. We are even glad that they have been used, for it is more than possible that they, quite unintentionally, represent an attitude or a frame of mind that we suspect means a great deal at the present moment.

The proposal to hold a National Electrical Convention next year has evoked a good deal of favourable comment, and it is still doing so. Even the organ of one of the electrical associations from which our title is quoted describes such an effort as "the obvious thing to do," but the difficulties—how they are magnified! How terribly menacing they are to the official mind—we read that they are "really serious," and that the proper organisation of "the obvious thing" is "the very devil"!

Anybody unfamiliar with the course of electrical organisation progress in Britain might imagine, after reading such nonsense, that we were still at the kindergarten stage. If the associations interested in the well-being of the electrical profession and industry, with their multitude of officials and their lengthy experience of conventions, congresses and exhibitions, do not know how to carry this project through to a successful issue in seven or eight months, they are less competent than we thought them. To score a great success is certainly worth a big effort.

Given the same enthusiasm in the official mind that there is in some other places, it would be found practicable to concentrate sufficient organising ability from the various bodies to reduce the mountain of difficulties. Get the right men round a table and they will soon hammer out a scheme for organising one big meeting instead of three. If they cannot do it, it will be high time for an inquiry to be held to see whether the industry and the profession are not paying too big a price for organisation as it stands to-day. Is the machine becoming too heavy, too lumbering, or too complex for its best powers to be turned on to an emergency for once?

When we urged the whole industry to appoint a big man to lead us on to success which should sweep Britain from end to end, those who are now afraid of the "very devil" weakly said, in effect: Such an appointment cannot be made now, we are not ready for it yet, let us wait another five years. "You have called me too soon, I must slumber again!" Is this kind of spirit worthy of the electrical industry?

The weakness of our position seems to be that the men whose duty it is to lead are so bound about by matters of petty detail which somebody else could handle that they are not free to think out new ideas, to plan big things, and to issue the general summons.

Nobody is better qualified than the ELECTRICAL REVIEW to pay a tribute to the various organisations for their excellent sectional and routine work; but we who say that also utter a warning lest our machinery becomes lodged in a rut and declines to function when a great opportunity for advance presents itself.

Indifference, lukewarmness and disinclination to move are worse than open opposition.

Sixty Years

NEXT Tuesday is our sixtieth birthday. The first number of the ELECTRICAL REVIEW was published on November 15th, 1872, since which date the journal has regularly recorded every electrical conception and achievement worthy of consideration. With the first of its one hundred and eleven bound volumes at our elbow as we write, we note the optimism of the first Editor, whose opening announcement alluded to "the importance of the applications of electricity." These sixty years have been filled with discoveries and practical applications which have transformed the ways of the world. Though the theme is attractive, we are not minded to look backward. The rapid progress of events urges us forward. Electrical science and indus-

try are still moving onward uninterruptedly, touching life at every point. Who will look sixty years ahead without a vision of electrical achievements vaster far than those of the past? What is the ultimate goal?

Christmas Trade

ELECTRICAL contractors and traders everywhere should prepare for a big retail business in electrical goods as Christmas and New Year gifts. The market is provided with a wider range than ever before, and the habit of giving electrical presents has shown a marked growth in recent years. Our "Domestic Issue" of October 14th should prove of special service in this connection. Electric fires, vacuum cleaners, radio apparatus, lighting fittings and shades, and so forth, form attractive presents, while everybody purchasing such goods will be spending money wisely, especially if the goods are British.

Far from Obsolescence

AN increase of output from Greenwich power station of 50 per cent. in ten years is not exactly a sign that the tramcar is becoming obsolete in big towns. The two new 20,000-kW sets installed will not be enough to deal with the peaks (which are 45 per cent. of the total), but should enable a thermal efficiency of over 20 per cent. to be attained. Much of the increased output is due to the higher speeds at which the 1,712 L.C.C. tramcars run over the 167 route miles of track, carrying 700 million passengers per annum. Some 800,000 passengers are carried within four hours at the peak, we learn from the *Pullman Review*, a booklet issued to the employés which deserves a far wider circulation. The demands of this service could not be dealt with so adequately by any other vehicle. Moreover, the tram cuts its own way through the traffic and marshals it into well-defined lines in accordance with the modern tendency.

Combustion Conditions

MR. J. H. PARKER, the electrical engineer to the L.C.C. tramways, approaches the question of boiler design from an original angle. He told us a few days ago that he thought the manufacturer of the stoker plant should be the main contractor and should dictate the combustion conditions to the boiler makers. He was not able to put his views entirely into practice in the recent extensions at Greenwich, but he selected two first-class examples of retort and chain-grate stokers, discussed with their makers the most suitable size of grate that could be installed in the available space, and decided upon the combustion space and other factors to give the best conditions. The duty required of each type of stoker was embodied in the specification, and alternative tenders for boilers were called for covering both. This method appears to us to have advantages. The rival tenders relate to identical conditions and the grate manufacturer cannot blame the boiler maker for spoiling the combustion.

To Speak or Not to Speak

How eloquent many of us have become at times in deploring the shortage of electrical orators to charm away our sadness! Soon we shall have to do so no longer, for we shall be flooding the land with young men and women able to carry everything before them, or at least to hold their own, wherever they go. E.D.A. has set itself the task of inducing them to qualify to tell the electrical truth with force and with charming persuasiveness. Overcoming all natural disabilities, they will, in emulation of Demosthenes with pebble in mouth (or will it be tongue in cheek?), compete for prizes of £5 and £3 respectively until they qualify for a National Competition which we shall hope to attend in London. How E.D.A. is proceeding to bring about this change can be ascertained from its little blue book, No. 1069, entitled "Public Speaking Competition." Be it noted that only junior members of the staffs of undertakings or firms are eligible; chief engineers, branch managers, and persons occupying supervising positions are either considered able to hold their own already or are judged beyond hope and to be left to linger longer muttering down into their collars or talking through their hats. Competitors have to talk concisely, clearly and cogently on any electrical subject of public interest in a way to edify non-technical people for fifteen minutes. The aspiring reader should make prompt application to his Area Committee or Circle and then betake him to the topmost floor of his domicile.

Electrical Accidents in the U.S.A.

IN our leading columns of October 14th we deprecated the scare statements that appeared in a lay contemporary regarding electrical accidents in the United States. We are glad to reproduce in our correspondence columns to-day a letter which we have received from the president of the Electrical Testing Laboratories, New York. Mr. Preston S. Millar's figures entirely justify the scepticism we expressed as to the number of fatal acidents in America that could be attributed to electricity, and show what an infinitesimal proportion they are of the total. It should also be borne in mind that but for improvement in general conditions brought about by electricity, *e.g.*, better lighting and elimination of belt drives, the number of accidents in streets, factories, and homes would be very much greater than it is.

Battersea

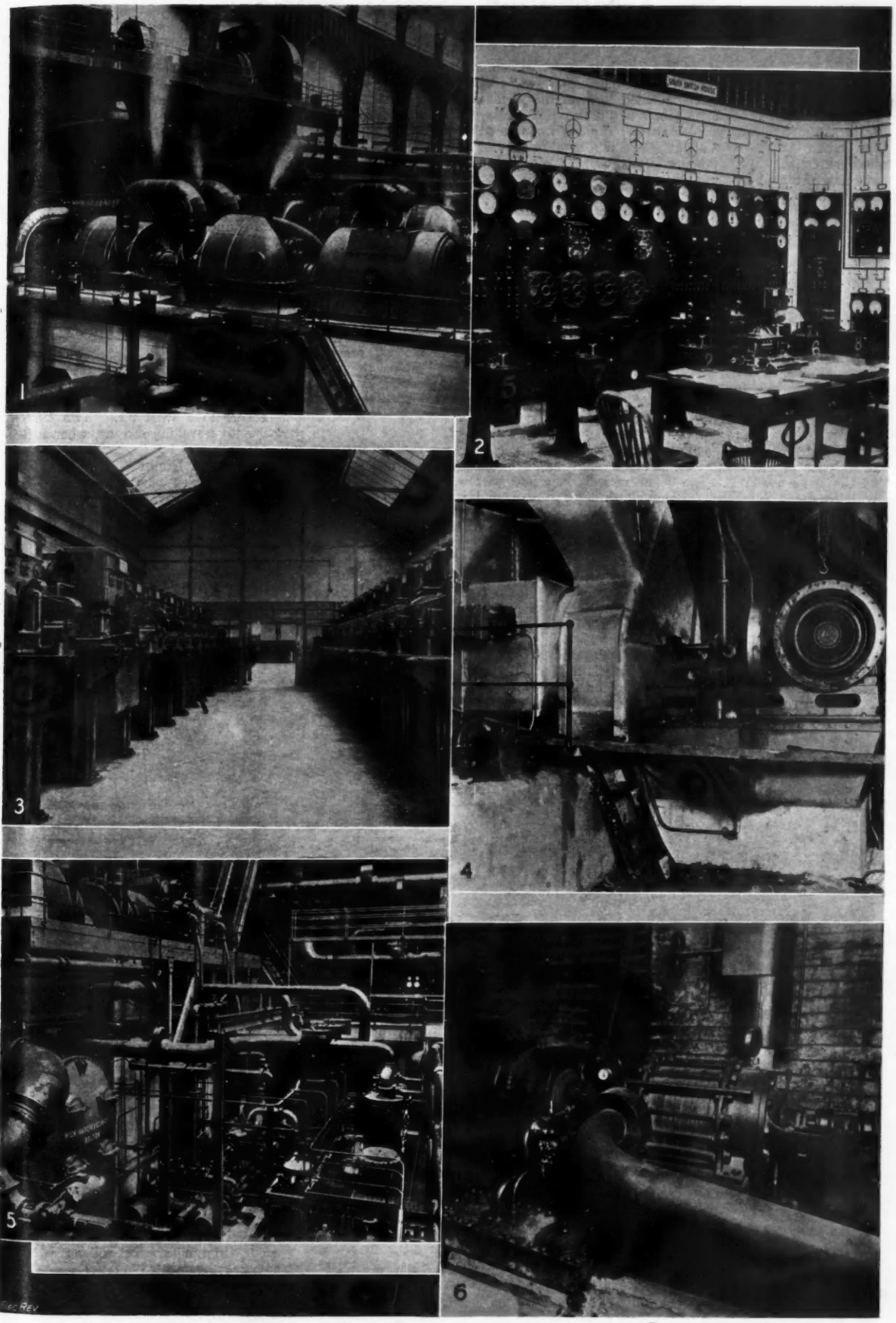
ON Saint George's Day last year a commemoration stone was unveiled at the site of Battersea power station of the London Power Co. in honour of Faraday, and also —we may add—of what is among the most striking results of his work. Last spring construction was far enough advanced for us to photograph the plant in course of erection (our issue of March 18th). Now Mr. Pybus has informed the House of Commons that the station will be in operation next summer, in conjunction with the grid in South-East England. Notable features of Battersea are 65,000-kW turbo-alternators, 80,000-kVA transformers in three-phase units, 330,000 lb. boilers with steam conditions of 625 lb. per sq. in., and 875 deg. F., and sulphur elimination plant. These are fine engineering achievements, but what is more important is how it will affect the consumers. Mr. Pybus anticipates that they will benefit. So do we.

The Hot Cathode Lamp

AT last week's I.E.E. meeting Mr. H. T. Young, in his attempt to "draw" Mr. C. C. Paterson on the new type of gaseous discharge lamp, reflected the general interest in a development that should be as big an advance on the tungsten gas-filled lamp as the latter was on the carbon-filament lamp. The brilliant exposition of the technical features of gaseous-discharge lamps presented by Mr. Paterson to the Illuminating Engineering Society on Tuesday evening gave an account of the stage to which his researches have carried the practical application of the hot-cathode lamp. The lamp is still short of perfection. The demonstration street at Wembley is well lighted, but the illumination is unflattering to foot passengers, and, although the lamps can be used in ordinary fittings, the disposal of the heat will present a difficulty. But to overcome these difficulties will, we imagine, require only a tithe of the intelligence that has been required to bring the lamp to its present stage. The 400-W units that are beginning to emerge from the experimental stage have an efficiency of forty lumens per watt, compared with the twelve lumens per watt of the gas-filled lamp. We can hope for appreciably higher efficiencies coupled with suitable spectral qualities.

Clockmakers to Co-operate

AN interesting development is the collaboration of the leading British makers of synchronous electric clocks, as reported in this issue, for the purpose of popularising the use of these clocks and to regularise the trade. It is the intention of the Conference to secure the control of supply frequencies all over the country to facilitate the use of this simple and accurate method of timekeeping by all electricity consumers.



The 40,000-kW Extension at the L.C.C. Tramways Power Station, Greenwich

1. The two 20,000-kW turbo-alternators. 2. A section of the control room. 3. English Electric 11-kV switchgear. 4. An induced-draught fan with motor slewed round to show the hydraulic coupling; photo-electric smoke detector on the left. 5. The condenser pit showing electric and steam-driven feed pumps, feed water heaters and evaporators. 6. A high-speed turbine feed pump

D

Greenwich Power Station

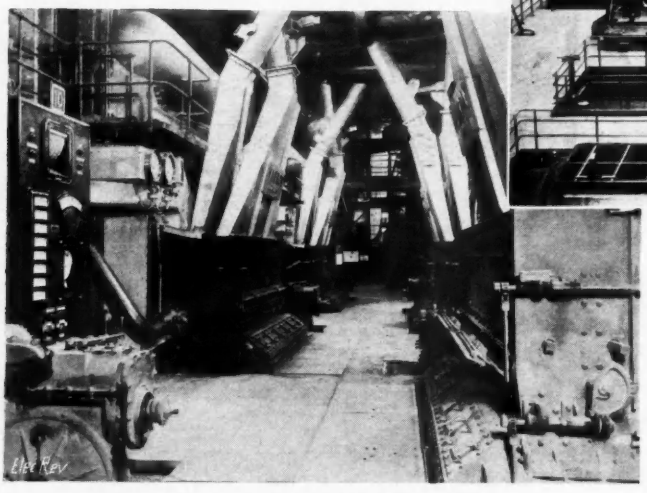
The 40,000-kW extension of the L.C.C. Tramways supply

A SECOND 20,000-kW set has just been put into commission at Greenwich, completing the new 40,000-kW section of plant that has been installed to meet the increasing demands of the London tramways and also, incidentally, to improve the efficiency of generation. The kWh generated at the station last year was about 240 million at a load factor of 47.5 per cent., the m.d. being nearly 55,000 kW. The output has increased by some 50 per cent. during the past ten years, and the fuel consumption per kWh has decreased from 2.51 to 2.05 lb., but with the new plant in commission a figure of 1.5 lb. is anticipated. Coal (about 11,000 B.th.u.) costs from 11s. to 12s. per ton in barges alongside.

The capacity of the station was previously only 62,000 kW to meet a demand of almost as much, and considerable ingenuity has been necessary to improvise means of maintaining a reliable supply. There was no room to install new turbines or boilers without first removing existing plant, so the inadequate stand-by was encroached upon by removing a twenty-four-year-old 5,000-kW turbo-alternator and twelve twenty-eight-year-old 16,000-lb. boilers and substituting the first of the 20,000-kW sets and five 50,000-lb. boilers. As soon as these were in operation, another 5,000-kW set and twelve boilers were removed and the erection of the second turbo-alternator with five boilers was begun.

The individual capacity of the boilers is small in proportion to the size of the turbines, but conditions were determined by the space available. The boiler-house is long and narrow with overhead bunkers running down the centre, and is divided into twenty-four bays on each side by the bunker stanchions. To obtain the largest unit with a single grate (for which the dimensions available were 18 ft. long by 11 ft. 6 in. wide) the boilers have been installed in alternate bays in the centre section between the four chimneys; grates occupy the full width of each bay and the boiler encroaches on both sides of the spare bay, in which the control panel is placed.

The arrangement is neat and provides comfortable operating room, while the lighting is distinctly good. The boilers have been staggered on each side of the centre aisle enabling fuel to be drawn from two overhead bunkers for each grate for burning on the sandwich system if desired. This arrangement has resulted in a considerable saving in building alterations.



The central aisle of the boiler house

Steam Generation

The boilers are of the Yarrow five-drum type. Though their normal duty is 50,000 lb. per hour, they are capable of a continuous overload of 62,500 lb. and of carrying a two-hour peak of 70,000 lb. We found the boiler-house staff very favourably impressed by their flexibility in meeting sudden calls. Of the three nests of tubes in each boiler, the front acts as a water wall (no gases passing through it), the second (between the furnace and superheater) acts as a screen, and the third, outside the superheater, is traversed by the gases three times. Steam conditions are 425 lb. per sq. in. and 780 deg. F., which we believe to be the highest in the London area. At this pressure the percentage condensation in the turbine is only eleven; a higher pressure would have caused undue wetness of steam in the later stages of expansion, unless reheating were introduced, in which case it was considered that a pressure of 600 lb. per sq. in. or more would have been required to justify the complication.

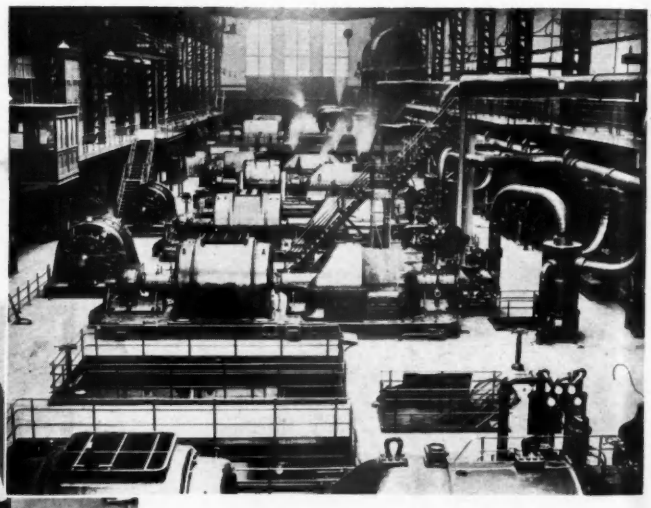
The stokers (Underfeed "L" type) are set low with Detrick "concave-convex" front and rear arches. The gases leaving the boiler pass through a Foster gilled-tube economiser (supplied by E. Green & Son), an "Usco" plate air heater, and a "Pneuconex" grit catcher. A "Pneuconex" vacuum cleaning plant is also installed. The Davidson forced and induced-draught fans are connected to constant speed motors by Vulcan-Sinclair couplings which enable speed variation to be controlled from the firing floor.

Each coal chute is fitted with a Romer-Lea coal meter in which a chain moved by the falling column of fuel works a cyclometer dial. Six Parry soot blowers sweep the dust from the boiler, economiser, and air-heater surfaces. The control panels (five Kent and five Bailey), which include combustion meters, smoke indicators (connected with photo-electric detectors in the outlet of the i.d. fans), and temperature indicators, were provided by Elliott Bros. (London), Ltd.

Ash-handling plant, by the Underfeed Stoker Co., sluices the ashes through a crusher to a swirl pit. Two 138-h.p. pumps discharge the ashes to travelling screens, whence it is shot into barges.

The Turbine Room

To reduce the risk to continuity of supply while the second turbine was being erected a reducing valve and desuperheater of 300,000-lb. capacity were installed to link up the 400-lb., 750-deg. F. steam range with the 200-lb., 550-deg. F. plant. The reducing valve is of the Venturi butterfly Hagan type made by the Victory Valve Co., and is controlled by a Hagan h.p. regulator. A Hagan thermostat regulates the amount of desuperheating water. If one of the sets should go out steam from the h.p. boilers automatically passes into the l.p. main. All joints on the steam range are of the welded "Corwell" type.



A general view of the generating plant

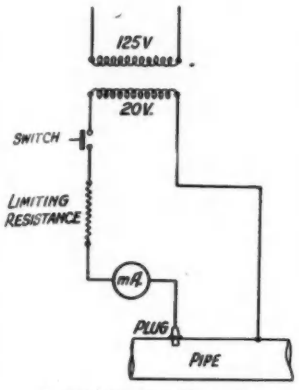
The 20,000-kW (m.c.r.) 1,500 r.p.m. B.T.-H. turbines are of the two-cylinder impulse type, bled at three stages for heating the fuel to 300 deg. F. (at m.c.r.) at the economiser inlet. The l.p. cylinder is a single-flow machine with one exhaust opening. The three-phase 25-cycle alternators generate at 6,600 V (95 per cent. p.f.). The stator frames are of fabricated steel, electrically welded. Ventilation is by fans on the rotor shaft and gilled air coolers, supplied with water from the condensing system. The main exciter receives its field current from a constant-voltage auxiliary exciter. The alternators are protected on the Merz-Beard self-balanced system.

Circulating Water Problems

The condensing plant and closed feed system was supplied by Hick, Hargreaves & Co., Ltd., for the B.T.-H. Co. The condenser has a normal duty of 130,000 lb. per hr. The vacuum reached is 29 in. (bar. 30 in.) with circulating water at 60 deg. F. Two "Hivac" air ejectors, which comprise two steam jets in series with intermediate and after surface

coolers (the cooling medium being the condensate) and duplicate "Hivac" twin-impeller extraction pumps are employed.

The equipment for indicating the presence of dissolved solids in the condensate consists of an insulated contact housed in a sparking plug screwed into the condenser discharge pipe, this contact being connected to a special 20-V a.c. supply through a push-button switch, a limiting resistance, and a rectifier type milliammeter. The milliammeter gives full scale deflection with 10 mA, and it is scaled 0-2.5 nominal parts of NaCl per 100,000, the scale being marked by immersing the plug in standard solutions of various known concentrations.



A condensate salinometer

Considerable rearrangement of the circulating water system was required to enable the new condensers to be connected without disturbing the existing plant and piping, and new common 60-in discharge and suction pipes have been run by Messrs. Mechan with valves by Alley & McLellan.

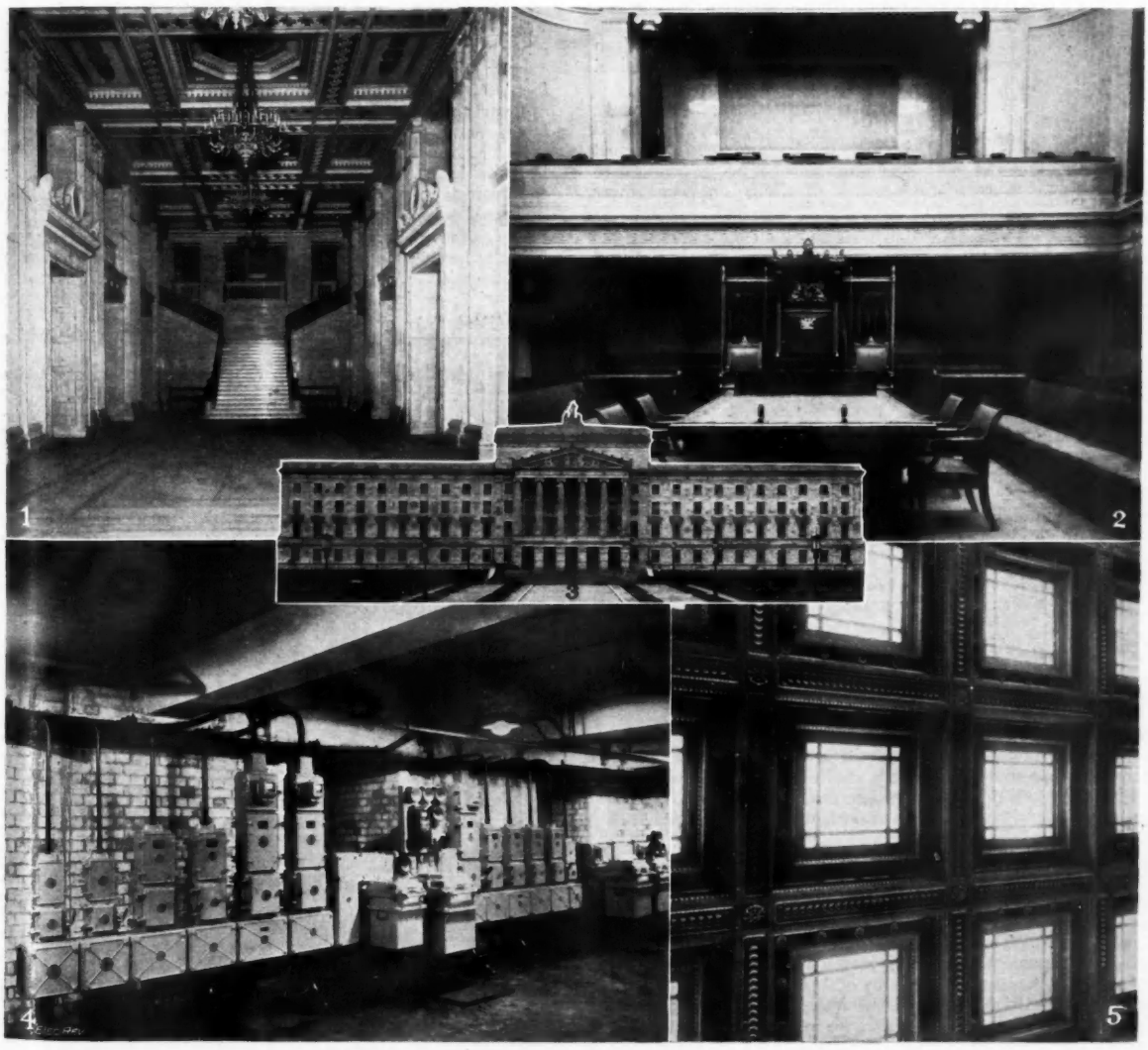
The circulating water is strained through a Hick-Hargreaves self-cleaning rotary water strainer, which enables full advantage to be taken of siphonic action; it is designed to deal with one million gal. per hr. and the cleanser box arm is driven at one r.p.m. by a 2½-h.p. motor. The Drysdale c.w. pumps are driven by Bruce Peebles motors.

In the condenser pits are three electrical and one steam-turbine pumps by Mather & Platt. Make-up feed is obtained from two Hick-Hargreaves evaporators, normally supplied by steam from the h.p. bled main, with a duty of 6,000 lb. of vapour per hr., which is condensed in the l.p. feeder heater.

Mr. J. H. Parker, M.I.E.E., chief electrical engineer of the L.C.C. Tramways

The auxiliaries for the existing station are supplied at 200 V, but for the new plant the pressure is 400 V. A new sub-station has been erected at the load centre of gravity containing three 800-kVA units by the Yorkshire Transformer Co., controlled by Crompton Parkinson switchgear. Switches by B.T.-H., Brookhirst Switchgear, Allen West & Co., Switchgear & Cowans, and the Electrical Apparatus Co. are also employed for the auxiliaries.

The control room and main switchgear were provided by the English Electric Co., and the forty-eight 6,600-V switches make an imposing array. Double lead-sheathed cable is used for the first half-mile of feeders from the power station. The feeders have overload and earth leakage protection and are run in ducts to the twenty-five converting sub-stations, most of which are fed by two radial feeders and also by interconnectors on a ring main.



The New Parliament Buildings in Belfast (see page 726)

1. The main entrance hall, showing the electrolier presented by H.M. the King. 2. The ground floor of the Senate. 3. A general view of the buildings. 4. The Holmes-Reyrolle distribution switchgear. 5. Roof panel lighting in the House of Commons

Transformers and Frequency Changes. By D. W. McJannet

The effect on performance and output

THE limiting factor in all problems of change of frequency, as it affects transformers, is the value of the induction density in the core. On this figure depends the iron loss, magnetising current, and the magnitude of harmonic currents.

Transformers designed for 50 cycles are usually worked at a maximum of 13,500 lines per sq. cm., and the induction density of a transformer designed for another frequency must not exceed this figure when operated at 50 cycles. A transformer originally installed for a lower frequency can be used on a 50-cycle system, as the induction density will fall in the ratio of that designed to the operating frequency.

The induction density (B) for a 25-cycle transformer is about 14,500 lines per sq. cm., and this would fall to 7,250 lines when it was used on a 50-cycle supply. Average values of induction densities for 33⅓ and 40 cycles are 14,000 and 13,800, respectively.

Mr. D. W. McJannet is a member of the engineering staff of the Transformer Department of Messrs. Johnson & Phillips, Ltd.

Increasing the Frequency

The iron loss is proportional to the square of the induction density. At 10,000 lines per sq. cm. the watts lost per lb. of iron is of the order of 0.73 at 50 cycles and 0.36 at 25 cycles. For a 25-cycle transformer operated at 50 cycles the figures would be: at 50 cycles (B=7,250) 0.384; and at 25 cycles (B=14,500) 0.757. Thus the iron loss at 50 cycles is about half that obtaining at the original frequency.

The copper loss will be slightly increased (say 5 per cent.) owing to the increase of the eddy loss component. The reactance varies directly with the ratio of the new to the designed frequency, and the large increase when changing from 25 to 50 cycles may prove troublesome, especially on poor power factors.

If a 500-kVA 25-cycle transformer has a 3 per cent. reactance and a copper loss of 7,000 W, and the power factor of the load is 0.8, the percentage regulation will be :—

$$1.4 \cos \phi + 3 \sin \phi + \frac{(3 \cos \phi - 1.4 \sin \phi)^2}{200} = 2.932,$$

where X=reactance per cent and R=copper loss per cent.

After changing to 50 cycle operation, the values of sin ϕ will be doubled and the regulation becomes 4.793 per cent., ignoring the slight increase in copper loss.

The impedance, which is the square root of the sum of the squares of the percentage reactance and resistance values, is affected by an increase in the former in proportion to the ratio of the new over the old frequency. The resistance is altered only by the slight increase in the eddy component. Taking the example given for regulation, the impedance at 25 cycles $=\sqrt{3^2+1.4^2}=3.31$ and at 50 cycles $=\sqrt{6^2+1.4^2}=6.16$; the increase thus depends upon the ratio of the reactance to the resistance, which is usually great.

Altering the Supply Voltage

When the supply voltage as well as the frequency is altered it is practically always necessary to rewind the transformer.

The voltage ratio is proportional to the ratio of primary to secondary turns, and consequently any increase in voltage applied to the primary will result in the same proportional increase in the secondary voltage. Almost the only exception to this is the case of a transformer designed for a voltage ratio E/e at 25 cycles which is changed over to a 50-cycle supply and a ratio of 2E/2e.

The explanation of this is that (ignoring the change of voltage) the change of frequency will result in the volts per turn remaining constant with a consequent halving of the induction density. If B=14,000 lines at 25 cycles, it will be 7,000 lines at 50 cycles. The voltage, however, is doubled at 50 cycles, and consequently the volts per turn will be doubled, thus increasing B to its original value of 14,000 lines. This is somewhat on the high side, and the iron loss at 50 cycles will be nearly doubled due to the difference in the watts loss per lb. of iron at 25 and 50 cycles. An advantage is that the output from the transformer will also be doubled without any increase in the copper loss, for the section of copper and number of turns will still be the same for the doubled voltage.

Although the supply voltage is sometimes altered when changing the frequency, the same secondary voltage is usually required, and this necessitates rewinding.

As a transformer works under uneconomic conditions when used on a circuit of a higher frequency than that for which it was designed, the question of rewinding it should be considered in view of the greater output obtainable. A 25-cycle transformer when rewound for 50 cycles should theoretically be capable of giving double its original output, but several factors prevent this in practice.

In the first place, it may be impossible to obtain the same copper space factor for both designs. Secondly, the turns at 50 cycles will be slightly more than half the original number, owing to the slight difference in the value of B at 25 and 50 cycles. The third factor is the difference in total losses. Owing to the halving of the number of turns and the doubling of the copper section and load current, the copper loss will be approximately the same at the two frequencies. The iron loss will be increased to approximately twice its 25-cycle value, as, while B will fall only from 14,500 to 13,500, the watts loss per lb. of iron will be roughly doubled.

This increased total loss at 50 cycles will be higher than at 25 cycles, and consequently the tank surface will be insufficient with the doubled output to keep the temperature rise within the limits specified in British Standard Specification No. 171.

The output obtainable from the transformer when rewound for 50 cycles will be from 70 to 80 per cent. greater. The outputs obtainable from transformers originally designed for frequencies of 33⅓ and 40 are from 30 to 40 per cent. and from 15 to 20 per cent. respectively.

Transformers Built at Higher Frequencies

It is generally necessary to rewind a transformer designed for a higher frequency before it can be run from a lower frequency system, as the induction density would otherwise be increased beyond the maximum permissible. Thus, a 100-cycle transformer normally works at 10,000 lines per sq. cm., but if operated at 50 cycles B would become 20,000—much too high a value. A transformer built for 50-cycle working might be suitable for 60 cycles if the original value of B were low; the average value of B is 12,500 for 60-cycle designs, and the makers should be consulted before coming to a decision.

The output obtained after rewinding would be less, as more turns are needed and consequently copper of smaller section must be used. As a slightly higher induction density may be used when rewinding, the increase in the turns would be $\frac{Fh \times (B \text{ at } Fh)}{50 \times 13{,}500}$ where Fh is the higher frequency for which the transformer was originally designed. The copper section would be reduced by approximately the same amount.

The copper loss at 50 cycles will be the same as for the greater output at the original frequency, with the exception of the eddy current component which would be slightly lower at 50 cycles. The iron loss will be slightly reduced at 50 cycles on account of the lower loss per lb.

When transformers are originally designed for a higher frequency the output obtainable when they are rewound for 50 cycles is where the original frequency was 100 cycles, 60 to 70 per cent.; 83⅓ cycles, 75 to 80 per cent.; 60 cycles, 85 to 90 per cent.

The pump house at Greenwich showing the rotary strainers **(see page 700)**

Some Municipal Electrical Engineers

From left to right: Mr. F. H. Rudd, Rochdale (*W. T. Carter*); Mr. F. L. Ogden, Oldham (*G. E. Rowland*); Mr. J. E. Starkie, Burnley (*J. R. Brunton*); and Mr. H. E. Annett, Bolton (*Kay & Foley*).

Electric Ship Propulsion.

By A MARINE CORRESPONDENT

Chances for electrical manufacturers to recover lost ground

THE launch of the French liner *Normandie* on October 29th should give our shipowners and shipbuilders furiously to think, and there is no doubt that electrical people in Great Britain should ask themselves what they have been doing in the last few years.

The *Normandie* will be easily the largest passenger ship in the world, even bigger than the new Cunarder which has received so much publicity recently, of 75,000 tons displacement, 1,000 ft. long, and with accommodation for 2,500 passengers. The most interesting fact about this transatlantic liner to many of us is her propulsion at 30 knots by four 40,000 s.h.p. 6,000-V three-phase synchronous double-armature motors, making 238 to 248 r.p.m. Electricity will be generated by four 34,200-kW 2,430 r.p.m. turbo-alternators. Steam at 400 lb. per sq. in. and 660 deg. F. will be obtained from twenty-nine oil-fired water-tube boilers with superheaters and air-heaters. There will also be six 2,200-kW geared turbo-generators for supplying auxiliaries; the speed of the turbines will be 2,300 r.p.m., and that of the 220-V generators 530 r.p.m.

Let us look at the question of electrical propulsion from the marketing point of view, and ask ourselves why it has not been more widely adopted for British ships. In this country we have one electrically propelled ship, the R.M.S. *Lochfyne*, a Diesel-electric twin-screw passenger vessel, which in the summer is on the Oban-Staffa-Iona run and in the winter carries mails and passengers on the Clyde between Greenock and Ardrishaig. The P. & O. Company has three turbo-electric liners, the *Viceroy of India*, the *Strathnaver*, and the *Strathaird*, which are frequently at Tilbury and normally do the United Kingdom-Australia run. Although in reality British-owned, the *Monarch of Bermuda* is permanently on the Bermuda-New York route as will be the *Queen of Bermuda* now being completed at Vickers's Barrow yard. With the one turbo-electric ship of the Union Steamship Company of New Zealand, which is running between North Island and South Island in New Zealand, we conclude the list of British-owned vessels with electric drive. True, there are six Ellerman cargo liners with exhaust-turbine electric auxiliary drive, two P. & O. ships, and the latest vessel so equipped, the s.s. *Erin*, carrying fruit from Central America to Europe, but these vessels, whilst they illustrate some of the advantages of electric drive, are only partly electrically propelled.

Foreign Confidence and British Conservatism

Even including the last mentioned ships the list is not imposing when we consider that the total number of electrically propelled ships in the world is over two hundred. Our latest production, the new Cunarder if she is completed, will offer nothing new in the way of propelling machinery except in the matter of power of the turbines and gears. Shipping people in this country are notoriously conservative, they did not adopt the Diesel engine until foreign competition forced it on them; French shipowners cannot be accused of being prone to reckless experiments, and it was only after long and careful investigation that the decision was taken to build the latest liner with electrical propelling machinery.

The American and French electrical people have met with a much greater measure of success than we have in this country, and it is significant that the *Bermuda* ships have been designed to suit American passengers. Electrical propulsion has been "sold" to the general public in the United States as well as to the shipowners. Is it not time the electrical industry in this country thought along these lines?

On purely technical grounds it is difficult to sell electrical propulsion equipment for ships particularly where owners and builders are already convinced in their own minds that their present ideas cannot be improved upon. Electricity for domestic use has not been sold on the straight issue of economy, it has succeeded in displacing gas because of its greater convenience, cleanliness, and flexibility. Figures could probably be produced to show that gas would be cheaper than electricity for lighting, but how many householders would change over having once become used to the various advantages of electricity to which a definite value cannot be assigned?

Similarly with ship propulsion; in practice the electrical drive is found to have advantages which cannot be given any actual value on a balance sheet. Thus the increased use of the electric drive for British ships seems to depend on the sales ability of the electrical industry acting as one unit. If only the various manufacturers could evolve some scheme of combining to sell the idea of electrical propulsion and use all their enormous resources, there is no doubt that they would be in a position to benefit when new ships are built.

Studying the Builder's Needs

In any campaign for more electrically propelled ships it would be wise to see that the interests of the shipbuilders were considered. Shipbuilders will naturally be most favourably disposed to the propulsion arrangements which do not deprive them of work and leave their engine shops idle. On the other hand if they were to oppose the electric drive they could make the task of the electrical industry an extremely difficult one. Ships are now being lost and broken up at a faster rate than new ones are ordered and even if trade does not increase much above its present dimensions fresh ships will have to be built. Mr. Runciman, the President of the Board of Trade, who is an authority on shipping, is confident that owners will have to build new ships before signs of trade revival are visible.

The market exists and so far the surface has merely been scratched. For small and special craft only such as tugs, ferries, tenders and dredgers the potentialities are enormous. Two new Cunarders must eventually be built and the comparison would be interesting if the second were electrically propelled. Is it beyond the powers of the industry to produce a sufficiently good case for electric drive for such a ship? Out of over two hundred electrically propelled ships only seven are British owned. If we had our proper proportion we should have 200 ourselves, as we own about 50 per cent. of the total of the world's tonnage.

Even in the U.S.S.R., where shipbuilding is a fairly recent industry, electrical propulsion is receiving a great deal of attention and arrangements have been made for a number of ships to be built under the next Five-Year Plan to have electric drive. Surely our electrical engineers and salesmen should not need lessons from a country only now on the threshold of industrialisation! The electric drive certainly has a future but what it will be in this country depends entirely on the electrical industry itself.

The Case for a National Convention

"We are not organised," says Mr. Jennings—"Get closer together!"

OUR readers are already fully aware that the desirability of holding a big National Convention next year in the interests of the whole electrical industry has been before the General Purposes and Finance Committee of the British Electrical Development Association, and stands referred to the Council. The subject has been discussed in these pages again and again during the last few years, but those whom one might have expected to take action have failed to do so, possibly owing to lack of courage or enthusiasm.

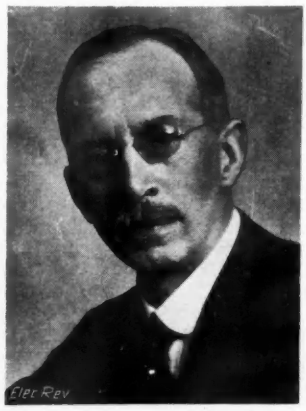
We stressed the idea in a leading article in our issue of October 7th and our opening article to-day is devoted to a particular aspect of the matter. We have since—indeed just at the hour of going to press—received from Mr. E. J. Jennings, Secretary and Commercial Manager of the Birmingham Corporation Electric Supply Department, a copy of the memorandum in which, as chairman of the South Midland Area Committee of E.D.A., he brought the matter before the Electrical Development Association in some detail. The memorandum is dated October 11th, 1932, and we print it almost *in extenso*, as follows:—

Mr. Jennings's Statement

The E.D.A. Council Minute is in the following terms:—

"That the General Purposes and Finance Committee be requested to consider and report after consultation, at their discretion, with other Institutions and Associations concerned, as to the desirability and practicability of organising a National Electrical Convention covering all sections of the electrical industry, in which could be merged the conferences of various sections which it is the practice to hold annually."

This question of a national convention for the industry has been raised from time to time for many years past, but, so far as I am aware, no real effort has been made to deal with it. The Committee have now to consider whether it is a desirable thing to work for, and if so, whether it is practicable. As an industry, we are *not* organised. *Sectional* interests appear to be effectively catered for, but we are so busily engaged each looking after our own particular interests that the larger possibilities arising from co-operation between the various sections within the industry are neglected.



[*Elliott and Fry.*

Mr. E. J. Jennings

Organisations, mostly well conceived and maintained for the purpose of furthering *group* interests exist for:—(i) the technical and professional element (I.E.E., &c.); (ii) manufacturers (both sectionally and as a whole, B.E.A.M.A., E.L.M.A., C.M.A., &c.); (iii) wholesalers (E.W.F.); (iv) contractors (E.C.A.); (v) supply authorities (a) municipal, (b) company; (vi) E.D.A., comprising all groups, for publicity purposes only.

I hope the Committee may be persuaded that it is both desirable *and* practicable to organise a national convention embracing all these interests, and will agree as to its potential value from a national propaganda point of view. E.D.A. is the only body in the industry in which all sections meet and work together for a specific purpose, and from the standpoint of publicity value, I submit it is for E.D.A. to take the initiative.

An American Example

One has but to read the full reports of the proceedings at the 55th Convention of the National Electric Light Association of America, held in June last, to realise what an immense piece of propaganda it was. This convention was attended by about 4,000 delegates and yielded much fruit. It certainly captured the Press of the country whilst it was in session. I submit that greater progress would ensue and greater benefits be obtained by our getting closer together, and that this desirable end can best be attained by the holding of all-in annual conventions on national lines.

It is of prime importance that the aims and objects of each section should be recognised and approved as proper by each other section concerned. If we can get substantial agreement as to inter-sectional relations, greater harmony will be secured and we can all get on with our jobs. For many years past in my own small way I have been preaching the gospel of "co-operation" between industries for national ends, such, for instance, as the British Industries Fair, and for co-operation within our own great industry, such, for instance, as between supply authorities and wiring contractors. E.D.A. has done magnificent work through its local Circles, which has resulted in much better relations being established between branches of our great industry that have such a large measure of community of interest. Circles meet for publicity purposes in the first instance, but seize the opportunity to dispose of sectional troubles as well.

The best means of securing unity of purpose and driving power with the maximum amount of publicity is by means of an all-in conference or convention. I have no cut-and-dried scheme to put forward, but such a convention could usefully be spread over from seven to ten days. It would embrace the technical side, the supply side, manufacturers, wholesalers and contractors. Three or four days could be used for the various sections simultaneously in different halls, to hold their sectional meetings—in private when necessary for the discussion of private or domestic matters, and attended by their own members only. Another three or four days could be given up to inter-sectional meetings for dealing with matters of special interest to two or more sections. The remaining days would be available for joint meetings, where papers could be dealt with of interest common to the industry as a whole. Opportunity would thus be afforded—every section being there—for differences to be considered, in the first instance privately, and subsequently adjusted, if possible at inter-sectional sessions.

The supply side is the key to the position and the need for close collaboration between it and the rest of the industry cannot be emphasised too strongly. Properly directed and with the assistance of skilled publicity agents, such a convention would capture the national Press and result in most valuable propaganda. Under the present system of individual conferences, grievances (real or imaginary) are aired with no one present officially to explain, combat, smooth out, or take steps to remedy them, and so time goes on with little advantage to the section itself, and practically none to the industry as a whole.

Saving Time and Trouble

Big conventions mean big publicity, and would attract big men. Big conventions mean the avoidance of a number of smaller ones, at intermittent periods. Thus the present system involves the withdrawal from their own businesses of a large number of men who find it essential to attend most of the annual sectional conferences, involving much loss of time and unnecessary expense.

At the present time we have the following functions, which I visualise as capable of being merged into one big event:—The I.E.E. summer meeting; the I.M.E.A. annual convention; the E.C.A. annual convention; the B.E.A.M.A. annual meeting; the I.A.E. Power Companies' annual meeting; and the E.W.F. annual meeting.

Is it practicable? I estimate that a National Electrical Convention would attract probably 3,000 delegates. There are many towns, some of them attractive health resorts, that can accommodate such numbers comfortably.

There may be some difficulty in persuading those associations that have held successful functions of their own in the past to sink their identity and to realise that there is more profit likely to come to them by merging their identity in a general convention. If you agree that there is a prima facie case for inquiry and that E.D.A. is the appropriate body to investigate the matter and take the initiative, I suggest the desirability of inviting all the associations concerned to appoint representatives to attend a joint conference, when the matter could be discussed from all points of view. I would again urge as a point for E.D.A.'s special consideration, that I see in this national convention, if it can be organised effectively, an opportunity for outstanding publicity that will eclipse anything hitherto achieved in the electrical industry.

A new era is coming up with the national grid beginning to function. In it one sees immense possibilities, but it calls for fuller team work. We must all pull together if we are to secure the fullest success. My submission is that every branch of the industry stands to gain by pulling its weight in a national effort, and what better step could be taken than the holding of a big National Convention on the lines suggested?

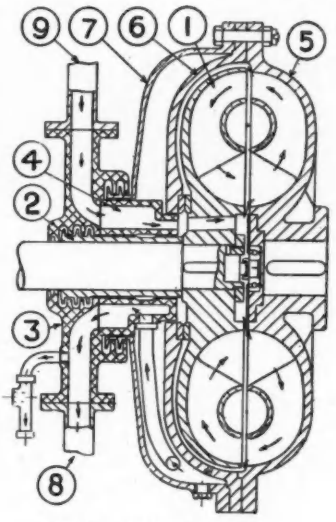
The E.T.B.I.

The annual meeting of the Birmingham & District Branch of the E.T.B.I. will be held at the office of the I.E.E., 65, New Street, Birmingham, on November 28th, at 7 p.m.

Hydraulic Variable-speed A.c. Couplings

IN our issue of September 2nd we referred to the use at Ironbridge power station of hydraulic variable-speed couplings between the forced and induced draught fans and their driving motors. The "Vulcan-Sinclair" coupling permits an easily controlled infinite variation of speed of the fans, although the motors are of the a.c. constant-speed type, by altering the amount of oil from a small overhead tank that circulates in the coupling.

The arrangement consists of a driving half or impeller mounted on the motor shaft and carrying a casing which encloses a driven half or runner fixed to the fan or driven shaft. Both halves are provided with radial vanes, and power is transmitted from one to the other across a gap of from $\frac{1}{4}$ to $\frac{3}{4}$ in. solely by the kinetic energy of the oil. Thus the impeller, acting as a pump, discharges the oil against the blades of the runner and drives it like a turbine. When the coupling is empty of oil the runner remains stationary and the impeller runs round idle.



Sectional plan of coupling

(1) Runner, (2) sleeve, (3) stationary manifold, (4) scoop tube housing, (5) impeller, (6) inner casing, (7) outer casing, (8) pipe leading to overhead oil tank, (9) downpipe for oil.

The oil is contained in a small overhead tank; the requisite amount is passed continuously by gravity over an adjustable control weir, operated by a screw thread and worm wheel to alter the height as desired, and down through a pipe, entering the centre of the coupling by an inlet branch and ports leading into the working chamber. From the latter a small quantity is continuously discharged into a scoop tube chamber rotating with the driving half, where it is picked up by a stationary scoop tube and returned to the overhead tank.

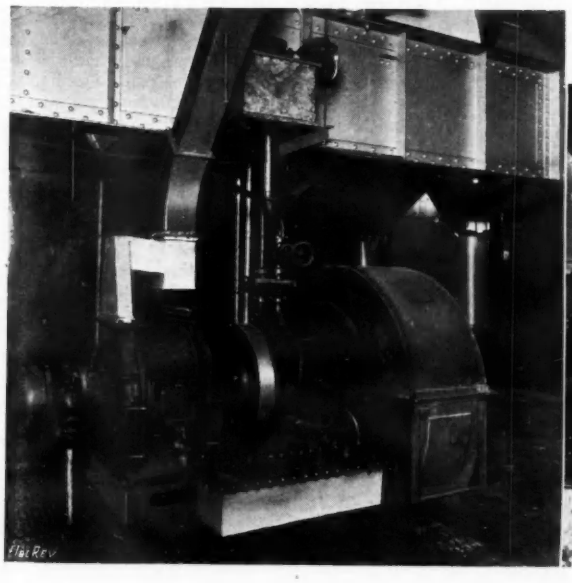
At Ironbridge each of the three Stirling boilers has two single-inlet "Sirocco" induced-draught fans, with a maximum duty of 76,500 cubic feet of flue gases per minute at $8\frac{3}{4}$ in. w.g. direct driven by 220-h.p. "Metrovick" squirrel-cage a.c. motors, and two double inlet forced-draught "Sirocco" fans each of 41,000 cu. ft. of air per minute capacity at 8 in. w.g. direct driven by 120-h.p. "Metrovick" motors. These twelve fans have "Vulcan-Sinclair" couplings, the induced-draught fan motors running at 580 r.p.m. and the forced-draught fan motors at 960 r.p.m. The couplings allow the fans to be run at any speed within the range of 20 to 98 per cent. of the motor speed, or lower if desired, under conditions of "distance" control from the firing floor.

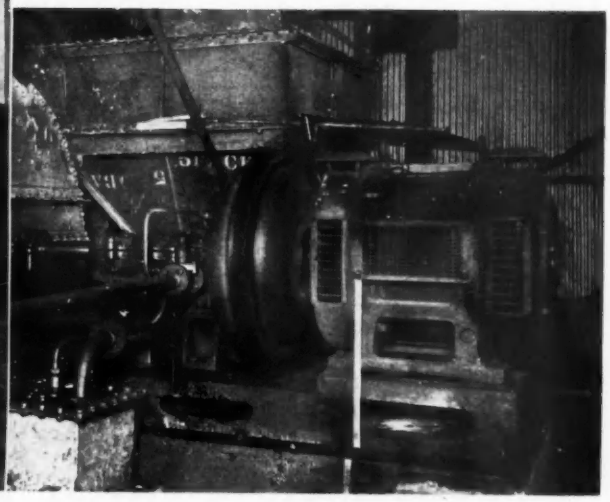
A Large Saving of Energy

The squirrel-cage a.c. motor can be started by switching straight on to the line, since at first the coupling is empty. The usual method of employing a constant speed a.c. motor driving the fan and throttling the draught by means of the dampers results in a great waste of power, and causes erosion of the fan wheel and casing. The first power station in the world having induced-draught fans equipped with the couplings was Lister Drive, Liverpool; this was soon followed by others, and detailed investigations show a range of 25 to 75 per cent. saving in the energy used, the average being 55 per cent. per annum. In addition, there are no major wearing parts, fine internal clearances, or soft packing of any kind. The design lends itself particularly well to "distance" as well as automatic control of any number of fans.

The coupling is the invention of Mr. Harold Sinclair, of the Hydraulic Coupling & Engineering Co., Ltd. It is an important advance on the basic principle of the coupling system developed by the Vulcan-Werke A.G., for marine work.

(Left) Forced-draught fan at Clarence Dock power station, driven by 65-h.p. 720-r.p.m. motor. (Right) Hydraulic coupling on 110-h.p. 750-r.p.m. induced-draught fan at the Ford works, Dagenham





Large Water Softening Plants

TWO large lime and soda-ash water-softening plants, such as are used for treating make-up water in power stations, have been completed at Northampton and Bletchley for the L.M.S. Railway. The latter has a vertical cylindrical reagent tank, 30 ft. high and 23 ft. in diameter, equivalent to six hours settling (an important point if much magnesium is present, which separates as magnesium hydrate not carbonate), the capacity being 12,000 gal. of softened water per hour. Operation is carried out entirely from the ground, including the mixing of the lime and soda ash reagents, which are injected by a specially designed pump, operated in step with the softened water delivery pump.

Two standard "Paterson" closed pressure vertical sand filters 8 ft. in diameter are installed with a filtering surface of 100 sq. ft.; their full load duty is 120 gal. per sq. ft. per hr. These filters obviate the use of self-contained wood-wool filters and remove all traces of suspended material from the softened water, which is claimed to be equal to town supply. The filters are cleaned by compressed air agitation and a momentary reversal of the water flow, the same sand lasting for years. The lime storage container holds an 18-hour charge of solution, and provision is made to add traces of sulphate of alumina to assist chemical treatment.

At Northampton, the reaction tank is 29 ft. high and 27.5 ft. wide, equivalent to six hours' settling, as before, with a capacity of 15,000 gal. per hr. The plant is otherwise generally similar to that at Bletchley, except that the two closed pressure sand filters are of the horizontal cylindrical type, 8 ft. long and 8 ft. in diameter with compressed air cleaning while the sludge is discharged from filter presses fixed on an elevated gantry over the railway track so that the hard cakes are discharged direct into wagons underneath at intervals. The two plants are part of an order for sixteen placed by the L.M.S. with the Paterson Engineering Co., Ltd.

High-frequency Electric Furnaces

IN our issue of September 9th we referred to a demonstration of steel melting by the "Witton" partially cored high-frequency induction-type furnace, which is manufactured under Stobie patents by the General Electric Co., Ltd. We have been afforded an opportunity of obtaining the further technical information which we give below.

In the earlier high-frequency furnaces the removal of the iron core (for practical and metallurgical reasons) reduced the useful flux available, owing to the lowering of the magnetic conductivity to the value for air. Also the presence of stray magnetic fields limited efficiency and prohibited the use of magnetic material in construction, though a palliative was subsequently found in the introduction of a magnetic shield of sheet copper, which, by concentrating heat loss within itself, prevented overheating of the steel casing.

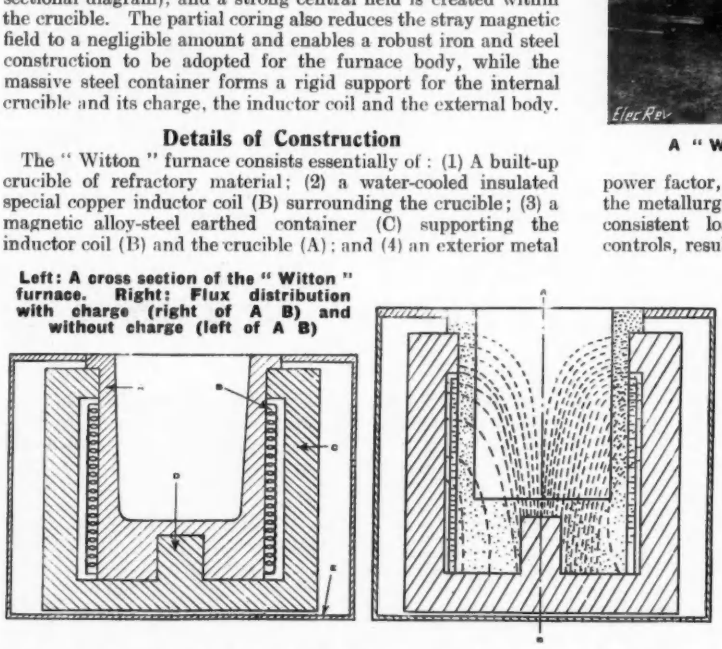
The new "Witton" furnace represents an important advance upon the low- or normal-frequency core-type induction furnace in that these disabilities are not incurred.

In this furnace the portion of the magnetic field that does not pass through the charge is taken through thin laminations of special alloy steel, the magnetic conductivity of which is several thousand times that of the air path in the coreless furnaces. This alloy steel path is brought to a substantial nucleus of a core in a central position below the crucible and in line with the vertical axis of the inductor coil (D in cross-sectional diagram), and a strong central field is created within the crucible. The partial coring also reduces the stray magnetic field to a negligible amount and enables a robust iron and steel construction to be adopted for the furnace body, while the massive steel container forms a rigid support for the internal crucible and its charge, the inductor coil and the external body.

Details of Construction

The "Witton" furnace consists essentially of: (1) A built-up crucible of refractory material; (2) a water-cooled insulated special copper inductor coil (B) surrounding the crucible; (3) a magnetic alloy-steel earthed container (C) supporting the inductor coil (B) and the crucible (A); and (4) an exterior metal casing (E) bolted to the container. The crucible is built of either acid or basic brickwork or of refractory material rammed into shape.

Left: A cross section of the "Witton" furnace. Right: Flux distribution with charge (right of A B) and without charge (left of A B)



The increase in the magnetic field due to the ferro-magnetic path has allowed a lower frequency and a higher voltage to be employed; the former reduces eddy-current and hysteresis losses and improves the power factor, and the latter reduces I^2R losses.

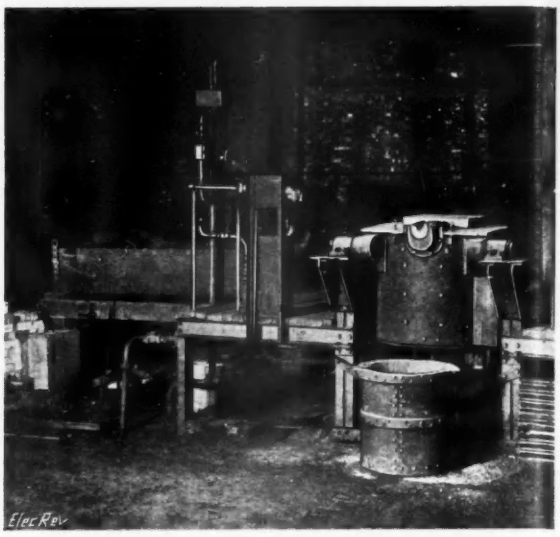
Current induced in metal by an inductor coil does not normally spread itself uniformly across the whole section of the metal and at the high frequencies used for melting steel the penetration tends to be shallow; a wide crucible of steel scrap within a coreless furnace is heated mainly near the inner diameter. The new furnace heats the scrap to a relatively uniform degree, as its central core forces a strong magnetic flux to enter the central portion of the crucible and to distribute itself evenly throughout the charge.

The surface of the molten metal is convex owing to inter-repulsion between the opposed magnetic fields set up by the current in the furnace charge and in the inductor which travel in the opposite sense. The central axial rise of the metal in the bath is the stronger, but the circumferentially upward force opposes and limits to practical proportions the central swell due to the relatively low frequency used for the "Witton" furnace.

Automatic Stirring

The design also facilitates the use of a wide crucible, which prevents the swell exceeding that requisite to give the automatic stirring effect which ensures uniformity of composition throughout each charge and which is peculiar to the high-frequency furnace. The furnace is tilted by an electric motor through spur and bevel gear, the axis of the trunnions being in line with the pouring spout.

The melting installation also includes a motor generator, condensers and automatic control gear. The main object of the control gear is to maintain a constant power input at high power factor, while the furnace man devotes his attention to the metallurgical process. Further advantages include a more consistent loading of the plant and quicker operation of controls, resulting in a high furnace output.



A "Witton" high-frequency induction furnace

After the motor generator has been run up to speed a regulating relay operates the field rheostat to raise the current and voltage to predetermined values. When the charge is red hot the full current is maintained on a falling voltage and the whole furnace coil comes into circuit. The power factor is controlled by the automatic switching in and out of the condensers.

The switchgear is completely interlocked and provision is made for the cutting off of current if the cooling water fails, if the motor generator becomes overloaded or if serious over voltage occurs on the h.v. system, and for the shutting down of the plant if an earth develops on the h.f. circuit.

Industrial Applications

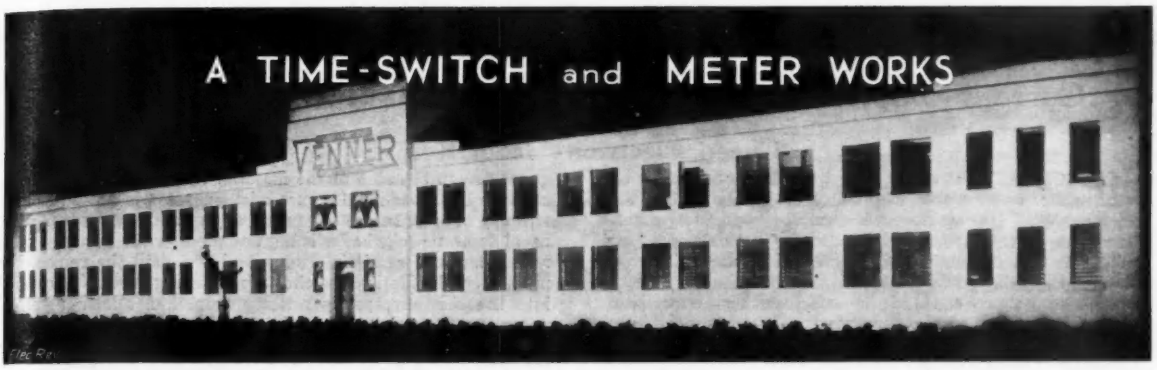
The most important application of this furnace is for melting alloy and carbon tool steels, stainless iron and steel, and other special alloy steels, but it has a minor field in the non-ferrous industries for melting, *e.g.*, nickel-chromium and similar alloys.

As an indication of the electrical efficiency of this furnace, 574 kWh per ton was recorded for a run of nickel-chromium molybdenum stainless steel in a 5-cwt. furnace. Steel has been brought from cold to pouring temperature for 485 kWh per ton. The only part of the furnace requiring periodical replacement is the crucible. Other advantages of the h.f. furnace are that rapid melting permits of a large output from a small unit, and that the small amount of refractory compared with other types of furnace enables the plant to be used intermittently without greatly increasing the running costs.

An Electrically Operated Road Bridge

Lord Provost Kelly, Glasgow, recently opened for traffic a new bridge over the Forth and Clyde Canal at Temple. Built by Sir William Arrol & Co., Ltd., to the designs of Mr. Thomas Somers, the City Engineer, the bridge is of the single leaf deck type. It is raised electrically to allow vessels to pass underneath, and the whole operation is controlled from a cabin situated at a corner from which the operator can see both road and canal traffic. Electrically operated gates close the bridge at both ends when it is raised, and motor drivers are warned by means of gongs and "stop" signals. The mechanism is designed to operate in sequence from the preliminary ringing of the gongs and the closing of the gates to road traffic to the actual raising of the 700 tons of bridge. The construction of the bridge and its approaches cost about £75,000.

A TIME-SWITCH and METER WORKS

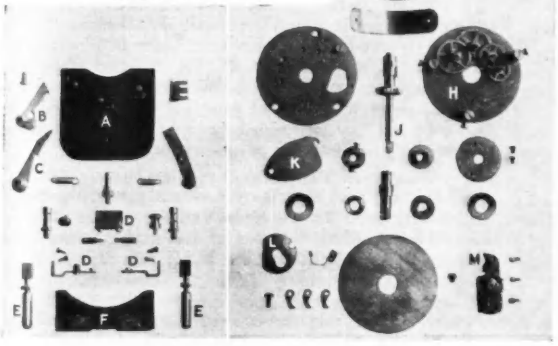


A RECENT visit to the works of Venner Time Switches, Ltd., justifies our calling it the "Home of Precision." Here they deal with fractions of a thousandth of an inch in an atmosphere of freedom and team work. The factory has a frontage of nearly 500 ft. on the Kingston By-pass Road, an extensive two-storey suite of offices facing the road, backed by the single-floor factory proper, covering an area of over one acre.

Time switches, are, of course, the major production, but it was obvious that the company's meter business is growing rapidly. The prepayment ampere-hour meter is proving popular for hotel-radiator control. More recent developments are an automatic rent collector for use with an ordinary standard prepayment meter, and a two-part tariff meter.

We must confine our attention to a few of the points which interested us most during our walk round. It was interesting to see switch and meter cases cleanly cast in aluminium produced from oil-fired crucible furnaces. A horizontal table grinder employed has a circular grinding wheel completely

A Baseboard for switch assembly; B and C levers controlling "in" and "out" operations; D switch contacts; E terminal plugs; F terminal board and sockets; G main spring in barrel; H clock train; J centre arbor; K escapement shutter; L Friction washer; M escapement.



"Bits and pieces" of a time switch

dividing the two parts of the table within and outside the wheel. Instead of drilling and plugging the containing plates for train gears, &c., dowel pins are produced by half punching the holes on one side and producing extrusions on the opposite side, leaving the dowels intact with the plate. All holes are punched down to diameters slightly smaller than the thickness of the plate. Smaller holes are dealt with by high-speed drilling machines. We saw some drilling 0.024-in. holes at 2,500 r.p.m.

Rapid Production

Among some excellent specimens of automatic machines is one producing oil-retaining bearings at the rate of one every five seconds from the solid, and involving in each case turning, boring, and cutting off. The following operations are performed in sequence on machines producing pinion blanks: turn pivot, stem and shoulder; headstock advance; turn rear shoulder and last pivot; and cut-off. Pinion gears are produced on very fine generation machines in which the pinion revolves at right angles to the movement of a revolving cutting worm immediately beneath it.

Gear-wheel blanks, excellent examples of press work, are ganged together for tooth cutting in the same way as for the straight pinions. All the clock pinions are of stainless steel, and Mr. R. C. Graseby, co-director of the company with Mr. E. E. Sharp, told us that they had beaten the foreigner in the machining of these. In the assembly shops were seen pinions being checked for shoulder-to-shoulder measurements on Graseby gauges with 250 to 1 magnification.

But the *pièce de resistance* is no doubt the company's pivot-fitting machine. This receives the pivot, micrometers it, with a modification of the gauge just referred to, drills the hole with automatic adjustment to the correct size for the pivot, and also burnishes the hole. All pivots are passed through this machine, and the product has been much improved by its employment.

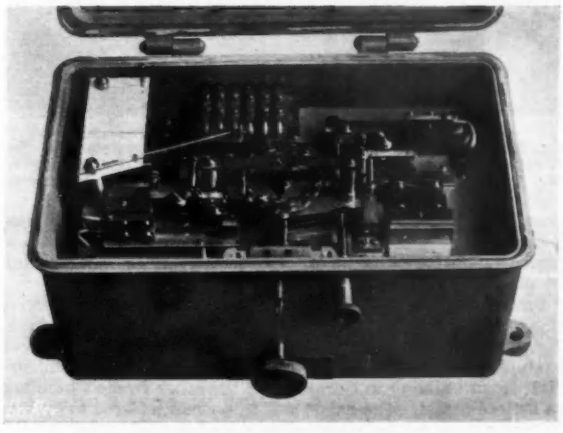
The pivot-fitting machine

The works is practically self-contained, and is equipped for such operations as the chemical etching of dials, name plates, barrel and vat plating, dipping, &c., and hot-lacquering on sand-blast finishing of brass assembly plates, &c.

Much interest lies in the numerous special equipments that have been, are being, or will be, produced for almost any class of work that requires precision control. An electrically controlled stop-watch is suitable for any purpose that requires highly accurate measurement, the operation of a switch, for instance, the switch itself controlling the stop-watch electrical circuit. The feature of this watch is the elimination of inaccuracies due to mechanical wear of the stop.

The timekeeping portion of Dr. Smith-Rose's radio beacon system is a Venner product. It is carried on the ship and directional signals are transmitted from the shore. Direction is found by angular measurement from the dial hand when this registers with the radio equipment loop. The master control and coder for wireless direction finding control equipment (which is in service in stations all over the world) starts up and stops the generator at definite times to provide energy for the signals, and controls the "coder" which sends out the actual signals during certain definite portions of each hour. The clock of this instrument can be wound and set to time when necessary without opening the case.

Apart from the instruments, some very fine switchboard equipment, &c., has been produced in the works, and banks of electrically wound time switches and two-part meters racked with bus-bar connections on running-in tests were impressive.



Coder for radio direction finding

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Cheap Electricity from Refuse

MUNICIPALITIES could save from 4s. to 6s. per ton of refuse, and be able to produce electricity at less than 0·2d. per kWh. If these figures are only approximately correct, it would mean that at least 50 per cent. of the cost of disposal would be saved to public undertakings, and electricity would be supplied to the grid at a cost lower than that at which it is likely to be produced by the most modern super-power station.

This is the conclusion arrived at by Mr. E. W. Smith, C.B.E., in a paper "Refuse Disposal" read before the INSTITUTE OF FUEL on November 9th.

The paper discusses the quantities and qualities (calorific values, &c.) of house and trade refuse which have to be disposed of in this country, and the cost of doing so; describes the various methods of disposal employed, showing important objections to some of them, and deals with a few actual and successful refuse-destructor installations, including that of the Huddersfield Corporation.

Great Potentialities

About twelve million tons of combined house and trade refuse has to be dealt with each year in England, and the cost of refuse collection and disposal in London is £1,100,000 per annum. In general, in this country, the calorific value of refuse is rather higher in winter than in summer, and respective values for southern towns are about 3,000 and 4,000 B.th.u. per lb. In the neighbourhood of coalfields the corresponding figures may reach 4,000, 5,000, or even more B.th.u. per lb. The moisture content varies from 10 to 40 per cent.

Mountains of rotting refuse are objectionable in that they form colossal breeding grounds for rats and flies. Tipping refuse into the sea is far from satisfactory because of the frequent return of much of the material to the beaches and foreshores. Pulverisation for manurial purposes is not supported strongly because refuse has practically no nitrogen value. The usual domestic coke boiler is not designed for the destruction of refuse, and the result is often merely to distil the refuse, the products of distillation and the accompanying dust being carried into the chimney, partly settling there and allowing yellow wisps of oily and greasy smoke to exude from the chimney.

To be successful commercial destruction plant must give a constant output of steam at any required pressure, a maximum steam production per lb. of refuse burnt, and have the greatest degree of mechanisation of refuse handling.

Disposal Made Profitable

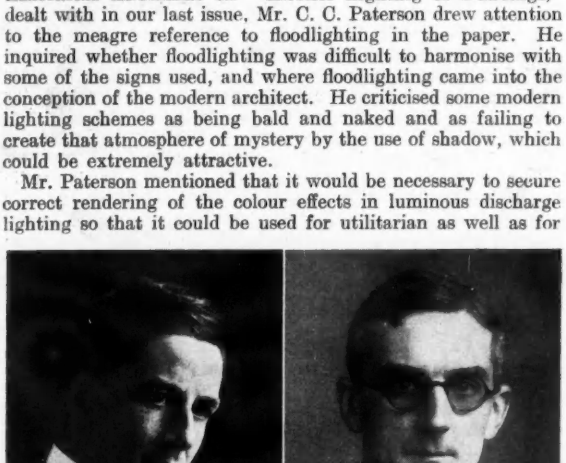
Reference in the description of the Huddersfield installation to an overhead electrically driven monorail telpher used for conveying refuse from a storage hopper to a distributor, and to a magnetic separator for extracting tins and ferrous metals, are reminders that the possibilities of electricity generation are not the only important bearing which refuse disposal has on the electrical industry.

The steam raising plant consists of four 200-lb. per sq. in. four-drum boilers, fitted with superheaters, each boiler unit working in conjunction with two water-jacketed and vertical-shaft refuse cells. Steam is fed directly into the mains of the adjoining power station. The output is remarkably steady and consistent, and the plant is in operation twenty-four hours per day. During the year ended March 31st last 26,916 tons of refuse was disposed of, and the equivalent amount of coal saved to the Electricity Department was about 8,000 tons, with the result that the plant has actually shown a profit, and so relieved the municipality of the bulk of the costs of disposal.

Illumination and the Architect

DURING the discussion on the paper read by Mr. A. B. Read and Dr. J. W. T. Walsh before the INSTITUTION OF ELECTRICAL ENGINEERS on "Electric Lighting of Buildings," dealt with in our last issue, Mr. C. C. Paterson drew attention to the meagre reference to floodlighting in the paper. He inquired whether floodlighting was difficult to harmonise with some of the signs used, and where floodlighting came into the conception of the modern architect. He criticised some modern lighting schemes as being bald and naked and as failing to create that atmosphere of mystery by the use of shadow, which could be extremely attractive.

Mr. Paterson mentioned that it would be necessary to secure correct rendering of the colour effects in luminous discharge lighting so that it could be used for utilitarian as well as for decorative purposes. Some illuminating engineers were endeavouring to secure a better balance of shadow and also a better quantitative method of measurement of the amount of shadow required for real comfort.



[Elliott and Fry.

Dr. J. W. T. Walsh, M.A. (left), is a principal assistant in the Electricity Department of the National Physical Laboratory. Mr. A. B. Read is Director of Design with Messrs. Troughton & Young, Ltd.

Prof. H. Robertson (Principal of the Architectural Association) said that a great deal remained to be done with floodlighting on an effective scale. There were only two real examples of floodlighting in London, one being the Commercial Union building in Cornhill and the other Drage's building in Oxford Street. The naked and bald effect referred to by Mr. Paterson must not be regarded as a tendency of modern architecture; modern designers could provide all the sentiment that the electrical engineer desired. Undoubtedly light, as a means of expression, had caught on in the architect's mind, but it had not yet reached its full development; the client, the architect, and the illuminating engineer must collaborate.

Hitherto only the advertising effect of signs had been considered, but until the æsthetic point of view was also taken into account we should not get real progress. Why could not neon stars be installed in the roofs of cinemas? The design of patterns in tube lighting was also behindhand, although there was something in this direction to be seen in Paris.

Modern Continental Practice

Mr. T. P. Bennett said that he had recently seen the latest efforts of the Germans, the Austrians, and the Czechs in lighting. The two outstanding features of the situation were the sudden development of lighting on a large scale and an enormous enthusiasm for indirect lighting. One result of the latter had been a considerably greater expenditure on energy; in Berlin there was an instance in which 9,000 W was specified where 3,000 W with direct lighting would have been ample.

To correct the flat and toneless effect there should be some visible light sources with low surface illumination. At the Universal Cinema in Berlin they were now using, with a view to economy, only 50 per cent. of the light which the architect originally installed. Blue coloured reflectors, he was informed, would cut off 75 per cent. of the light, but in the Titania Palace in Berlin the percentage lost was very much greater. As matt surfaces collected dust he was invariably compelled to adopt something glossy.

Mr. G. H. Wilson was astonished that lighting in places such as cinemas and underground railways had been improved to a vastly greater extent than in the home where most people spent a large proportion of their time. That was probably due to the electrical engineer not being consulted by the architect to the same extent for private house lighting. He suggested that a great deal more might be done in assisted wiring schemes to get away from the conical opal shade. It was now possible to obtain opal glass fittings which prevented the filament of the lamp being seen and yet only cut off about 10 per cent. of the light. He also referred to a lamp in use in America which comprised a mercury arc playing between tungsten electrodes, the whole system being enclosed in a bulb so that harmful rays were not transmitted. The results were claimed to be very close to those of sunlight.

Efficiency and Effect

Mr. H. Long (Benjamin Electric, Ltd.), mentioned that the American Illuminating Society had published a complete range of "utilisation factors" for certain types of diffusing glass ware. Admitting that the architectural effect must take the first place he suggested there was no reason why the lighting

should not be carried out in an efficient manner. Too often, in the case of panels, lamps were simply studded behind the glass and no effort was made to reflect the light efficiently.

Mr. H. T. Young expressed the view that engineers in striving after efficiency had not considered effectiveness sufficiently. Things had changed during only the past five years and the architect was now appreciating electricity for lighting in internal decoration. Even if a few lamps were taken out to keep down running costs that would not prevent progress. It was right to improve the lighting of public buildings, because that had a tremendous psychological effect upon the public.

He had seen the high-voltage tube used in interiors and the decorative effect was most pleasing. He hoped the manufacturers of the low-voltage discharge tubes were not waiting until they considered them more or less perfect before putting them on the market. An important factor to be borne in mind when planning a lighting installation was that 80 per cent. of the people of this country had defective eyesight.

Tube Lighting Prospects

Mr. Read, replying, said that floodlighting was not covered in the paper because it was such a controversial subject. One decorator had referred to it as an outburst of "foot and candle" disease. He did not think the engineer should have too free a hand in planning lighting installations, and the architect ought to be regarded as a sort of umpire to adjudicate on competing claims. The advent of the tubular lamp might well cause a revolution in architectural design.

Dr. Walsh said that matt surfaces must inevitably hold the dirt if they were to be good diffusers. If oblique reflection of the light could be avoided, then a moderate diffuser would be suitable. The only hope of avoiding the large loss of light mentioned by Mr. Bennett was a luminous discharge tube which gave practically all the light in the blue part of the spectrum. As to whether diffusing surfaces were needed with these lamps and reasonable approximation to white light could be obtained, perhaps the best solution to avoid difficulties from mixing colours from different tubes would be to have some kind of diffuser which would produce the right mixture.

He had seen a number of high efficiency luminous tubes which gave a fairly white light but he had had difficulty in distinguishing some colours. It had been said that the colour sensitivity did not disappear until the illumination was considerably lower than one-tenth of a foot-candle but he hoped we were not going to get down to these intensities in order to avoid the colour difficulty.

The Advantages of Pneumatic Conveying

IN his paper on "The Pneumatic Conveying System and some of its Applications," read before the Belfast Association of Engineers on November 9th, Mr. J. S. Loutit outlined the advantages of the pneumatic system of conveying materials in granular form—grain, small coal, ashes, &c.—in and about factories and power stations.

The system requires little space and the pipes may be run under or over roads, through buildings and in confined spaces generally, where the application of mechanical methods would be impossible—a valuable feature in power-station work. The material is retained in a dry state, and there is no sludge, with its attendant disadvantages. Absence of dust results in cleaner and healthier surroundings, and leads to economy if the material is valuable.

When the material has to be collected over a wide area the flexibility of the system is an important feature. In residential districts the silent operation is a valuable asset. As all the moving parts are concentrated at one point, where they are more likely to receive attention, the risk of breakdown is reduced. One installation can be used for a variety of materials—coal riddlings, flue dust, &c.

Factors Determining Capacity

Discussing the principle of operation, the author points out that the material is not drawn or pushed along the pipe by air pressure as in a pneumatic tube for conveying cash, telegrams, &c., but is carried along by the velocity of the air in which it is immersed. The capacity of a given size of pipe varies according to the length of the pipe, to its disposition, and to the air velocity. The rate of handling also varies according to the size of the particle, its weight, and surface.

The constructional features of main components—the collector, the pipe line, the receiver, the air cleaning apparatus and the exhauster—are outlined. The turbo exhauster, as compared with the reciprocating equipment which is still the most favoured type, has a fairly wide application for heavy duties only, as for small capacities it is very inefficient. It possesses the advantages of small weight and small bulk, which make it particularly suitable for portable or floating equipments. One inherent disadvantage of this type is the unstable characteristic of the delivery with a varying vacuum.

An installation operating in conjunction with a battery of stoker-fired water-tube boilers at a large London power station is described. It handles riddlings from the stokers and the flue dust deposited in the boilers and economisers; a separate range of piping, &c., serves for the vacuum cleaning. The entire plant is in duplicate, all parts being interconnected, so that their "spares" can quickly be brought into action in the event of a failure.

Test room switchboard and testing racks at the Venner works **(see p. 707)**

Cold-cathode Lighting Tubes

COLD-CATHODE luminous tubes are ideal for advertising purposes, but not for general illumination where the source of light is hidden. These tubes require high voltages and yield a small amount of light per foot of tube.

Mr. C. C. Paterson, O.B.E., showed in his lecture to the Illuminating Engineering Society on Tuesday last that if the cathode is heated to a temperature at which it will emit electrons freely, the cathode fall (the drop in voltage near the negative electrode) will be greatly reduced, and large currents can be passed without serious sputtering. In the hot-cathode tube the electrodes are alkaline-earth oxides or oxide-coated metal cylinders, heated electrically. The cathode fall is only from 25 to 30 V, and the current may be from thirty to one hundred times that possible with cold cathodes, and is only limited by the effect of the heat developed by the discharge on the glass walls.

The running voltage is so small that the discharge can be maintained on the ordinary supply voltages. A current-limiting choke and a small filament-heating transformer to supply current for the electrodes are required. It is generally necessary to provide a momentarily high voltage to start the discharge, *e.g.*, by a small high-frequency Tesla coil.

The gas used must, when excited, emit a suitable spectrum, and it must not decompose under the action of the discharge or attack the glass or electrodes. For a vapour (as distinct from a gas) the pressure must be appreciable at temperatures below the softening point of glass. The colour of the glow must be useful. Most gases or vapours emit radiation in a few limited regions of the spectrum, thus differing from the tungsten-filament lamp, which emits all wavelengths of the visible spectrum. The starting voltage varies greatly with different gases; both starting and running voltages should be low. The gas should not become immobilised on the glass walls so as to call for replenishment.

Suitable gases are neon (red), helium (ivory white, or yellow in special glass), nitrogen (buff), carbon dioxide (daylight white), and argon, krypton, and xenon, in conjunction with other gases or vapours. Vapours employed are mercury (blue to white, according to pressure, and green in special glass), sodium (yellow), cadmium (greenish blue), thallium (green), and magnesium (grass green). A white light can be obtained from a neon tube in which the correct quantity of mercury vapour is maintained.

Each gas requires a particular value of voltage to stimulate it,

and if several are in a tube, the gas requiring the lowest voltage will predominate and give the hue to the radiation. This applies especially to the positive column, as near the cathode the characteristic colour of gases requiring the higher ionisation voltage will often show up.

High Power Factors

As the gas discharge does not obey Ohm's law the wave form of the current or of the voltage across the tube is not a sine curve, its shape depending upon the type of tube and upon the circuit conditions. The use of condensers will not, owing to the considerable distortion in the wave form, bring the power factor to unity, but with some types of hot-cathode tubes 95 per cent. may be obtained (compared with 80 per cent. with cold-cathode tubes running on leakance transformers).

Gas-discharge tubes follow the current changes on a 50-cycle supply more closely than do filament lamps, and the " succes-

Experimental street lighting employing the new hot-cathode tubes described by Mr. C. C. Paterson

sive image " effect of moving objects is more marked. This effect can be eliminated by running nearby tubes on different phases if a three-phase supply is available. Alternatively, the tube may have two anodes at one end and a cathode at the other, so that the current will flow through the tube in the same direction at each half cycle, but first through one half of the circuit and then through the other.

An inductance in the circuit will cause the current half-cycles to overlap. Mr. Paterson believes that this effect is not so troublesome as the " flicker " effect on 25-cycle systems. He discounts claims for monochromatic light, as it causes objects to appear of the same colour, and the alleged greater effectiveness of discharge-tube illumination can only be obtained at the cost of affecting the colour of objects.

External factors affecting efficiency are losses in the series reactance and condensers. Internal factors are more complex. Some gases and vapours are efficient as light sources because they emit comparatively little outside the visible spectrum. If all the energy supplied to a discharge tube were emitted at a wavelength of 5,550 Angström units, corresponding to the peak of the relative luminosity of the eye, the luminous efficiency would be about 670 lumens per watt instead of the twelve lumens per watt obtained with the 100-W incandescent lamp.

Taking all factors into account we might expect a luminous efficiency of 360 lumens per watt. Sodium lamps of 100 W can be made with an efficiency of 70 lumens per watt. The difference is due to the transformation of electrical energy into heat at the glass walls due largely to elastic collisions between atoms and electrons below the critical ionisation value. The most efficient tube will have the greatest possible lagging and the heat-producing processes the least required to maintain the tube at the required temperature.

Two Applications

By placing neon and mercury tubes close together in parabolic reflectors, buildings can be floodlighted in colour. A new type of tube developed at the G.E.C. Laboratories, Wembley, is being made at present in 400-W units. It consists of a vertical tube in which the discharge takes the form of a narrow cord of light about 6 in. high. The efficiency is about 40 lumens per watt and when fully developed the tube should be particularly suitable for street lighting. Our illustration shows an installation employing these tubes in a street outside the Wembley laboratories.

Atomic Bombardments

HOW atomic projectiles are produced and their high speed is greatly accelerated to enable them to be applied to the solution of important physical problems is described in a general way in the nineteenth Thomas Hawksley Lecture, which Prof. Lord Rutherford delivered at the INSTITUTION OF MECHANICAL ENGINEERS in London on November 4th.

The study of the effects of collision of atomic projectiles with the atoms or molecules in their path has proved of great importance to the advance of physics in many directions. When an electric discharge is passed through a complex gas or vapour at low pressure, in general, a variety of kinds of charged atoms and molecules are formed. In the hands of Sir J. J. Thomson, a method of chemical analysis of these flying particles has been perfected, depending on the variation of the deflection of the particles of different charge and mass when acted on by a combined electric and magnetic field. This general method of analysis has been carried farther by Aston, who has devised a " mass spectograph " in which, by a suitable combination of an electric and magnetic field, particles of the same mass but with different velocities can be brought to a sharp focus on a photographic plate. In this way, he has been able to bring out in a striking way the complexity of the chemical elements and the relative intensities of the isotopes of which they are composed. In addition, he has been able to compare the relative masses of the individual isotopes with great precision. This new method of atomic analysis has proved invaluable, not only in throwing new light on the constitution of the elements, but in accurately fixing atomic weights.

The scattering of electrons by collision with the atoms of matter and the laws that govern the absorption of swift atomic projectiles in their passage through matter has opened up a wide and important field of work involving the study of projectiles of different masses and charges over a very wide range of speed. The electron or proton of a few volts energy is very easily stopped by the thinnest sheet of matter, while the fast electron or proton connected with the ultra-penetrating rays may readily pass through several feet of lead.

The latter part of the lecture is confined to a consideration of the way in which swift α-particles have been used to throw light on the dimensions of the atomic nucleus and on the laws of force which hold in its neighbourhood. This is followed by an account of experiments on the transmutation of matter, which has been effected by the bombardment of matter by swift atomic projectiles of different kinds.

Electric Vehicles

The paper which Mr. R. J. Eldred read before the London Students' Section of the INSTITUTION OF ELECTRICAL ENGINEERS on November 11th describes the salient features of the design, both mechanical and electrical, of the Tilling-Stevens' petrol-electric omnibus, the Sulzer Diesel-electric locomotive, the Garrett electric lorry, and the Drumm battery train (G.S.R., Irish Free State). Following a commentary on the economic aspect of each type of vehicle, brief reference is made to the Turrinelli battery vehicle and the *Monarch of Bermuda*.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Domestic Four-wire Services

I think that Mr. Byers's somewhat severe criticism in the ELECTRICAL REVIEW of October 28th of my letter regarding domestic four-wire services calls for some reply. In the first place Mr. Byers assumes that apparatus is installed according to the I.E.E. Wiring Rules, all metal-work being efficiently earthed. It has been my experience that in not one house in ten does the electrical installation conform completely to these Rules. In many houses there are small portable heaters in which no provision is made for earthing the frame. Often these are eminently suitable for use as footstools.

Many readers of your journal will no doubt have had the experience of finding that some framework, alleged to be earthed, is most unpleasantly alive. This may easily occur in some apparatus properly installed in the first place. Brass lampholders—not earthed—must be in use in hundreds of thousands on 230 V a.c. in various parts of the country. Protected holders are unfortunately all too rare.

Industrial installations are quite a different matter; for one thing they are regularly examined by factory inspectors, by insurance engineers, and probably by maintenance engineers. Few domestic installations are inspected until after a fault has developed.

It seems to me that at the present time it is the engineer's duty to protect the householder so far as is possible and one way to do this is to give single-phase supplies to private houses. Mr. Brierley's suggestion for balancing certainly seems an improvement upon my idea of placing 33⅓ per cent. of the houses on each phase.

Durham, *November 2nd.* COLIN PIDD, B.Sc.

Regarding a Lighting Fitting

Mr. Barton in his letter in your issue of November 4th takes exception to some of the statements made on behalf of the G.V.D. fittings. I gather that he is not questioning the efficiency of the G.V.D. architectural system of lighting, where, admittedly a single lamp does effect what a large number of lamps are commonly asked to do. He seems to be referring rather to the pendant type of unit, a description of which appeared on page 399 of your September 16th issue, and here, I venture to suggest, he rather misinterprets the claims that have been made.

It is true that the G.V.D. unit when used with a lamp of given wattage does emit more light than many other fittings which are usually regarded as efficient, yet it is mainly on the efficient control of the distribution of light that one relies for results. With this unit one avoids an unnecessary amount of light being directed on to the ceiling and thus (without in any way causing the ceiling to appear insufficiently illuminated) obtains a *working illumination* which is frequently 50 per cent. more than is obtained from lamps of similar wattage used in other and less efficient ways.

Aldwych, W.C.2, *November 7th.* G. V. DOWNER.

Electrical Accidents in America

Your issue of October 14th contains an editorial allusion, to comment in a lay contemporary, from which this sentence is quoted:—

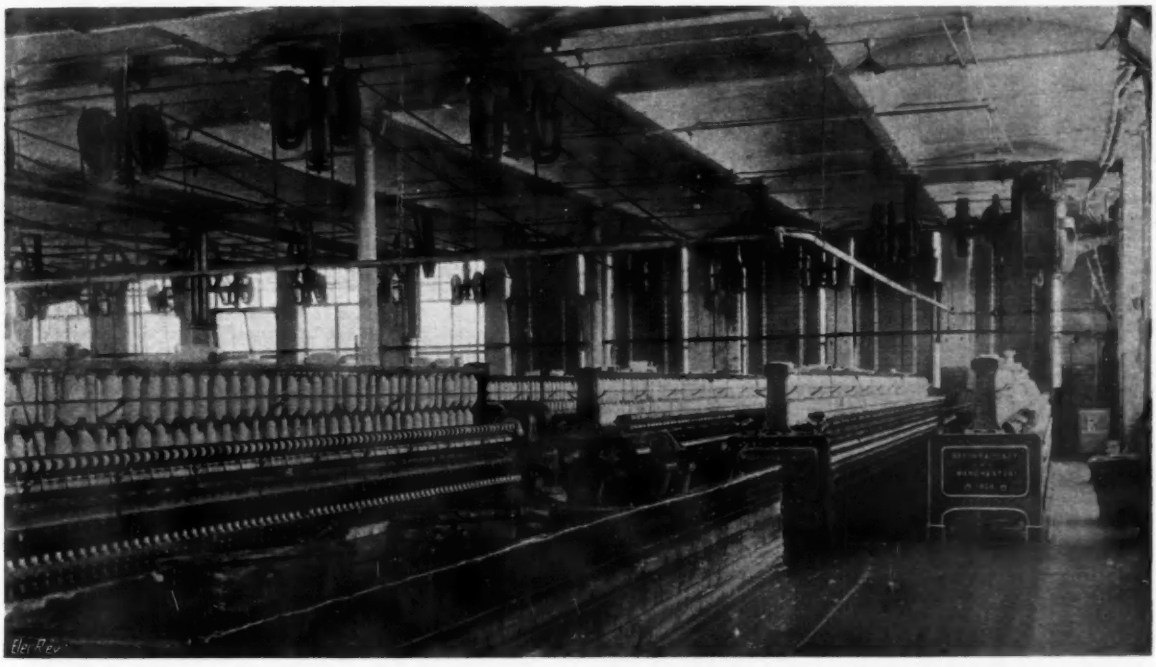
> "In America, probably because of the wider use of electricity, the number of accidental deaths in the home reaches an enormous figure each year."

The facts are that the best available statistics indicate that the total number of fatalities in domestic electrical service among a population of about eighty millions of people served. is fewer than twenty per annum. This is in a country in which traffic accidents last year caused about 33,000 deaths. Our statistics show further, that the number of persons killed in falls on walkways, including sidewalks, floors and stairways in New York City alone in one year was 545.

Contrary to the lay writer's assertion, fatalities from domestic electric service in America are remarkably few. You may wish to take some steps to correct the grossly erroneous impression to which the foregoing quotation may give rise.

PRESTON S. MILLAR,
President, Electrical Testing Laboratories.

New York, *October 27th.*



An example of group driving for ring spinning machines in a large Lancashire cotton mill. Three 150-h.p. motors serve about ninety ring frames by rope drives from a central shaft

Intensive Domestic Development

With reference to Mr. H. T. Jager's letter in your issue of November 4th, may I follow "National Economy's" good example and quote a passage from the Board of Trade Industrial Survey of Lancashire: "The need for bold selling may be greatest in rural areas . . . . but at present insufficient attention is paid to selling to domestic consumers in thickly populated areas."

I do not know what the writer of the passage had in mind, but my reading is that as the Electricity Commissioners have devoted much attention to rural areas and have set up demonstration schemes at Bedford and Norwich, why not tackle the question of domestic supplies in town areas and even set up a town demonstration scheme? To my mind the need for bold selling is much greater in town areas and, of course, it is much more likely to be highly remunerative to the supply authority and will create a vast volume of work for all concerned. In fact, until electricity is applied to major agricultural operations, rural supply really resolves itself into domestic supplies to scattered residences, so why not go for crowded areas?

The many complaints which appear from time to time in the columns of technical and other papers, regarding the high charges and lack of enthusiasm of some supply authorities for heavy domestic consumption, suggests doubt on the part of those authorities as to the profitability of the load. Figures relating to experience in other areas would do much to solve the problem one way or the other. In particular it would be of use to know the effect of bringing the running charge of a domestic tariff down to ½d. per kWh or even lower, a move which seems to be most desirable with a view to encouraging the maximum usage of electricity in the home.

November 4th, 1932. NATIONAL DEVELOPMENT.

The Future Prospect for the Electrical Engineer

The remarks of Dr. Marchant, and your own comments on the above subject, particularly relating to the electrification of rural areas, are interesting. I fail to see, however, how the present plight of agriculture can offer any grounds for optimism to electrical engineers. Having spent a considerable amount of time during recent years in rural areas and farming districts, it appears to me that unless immediate and drastic steps are taken to save the agricultural industry from ruin we shall find our excellent system of overhead lines traversing derelict farms and cottages, and farm lands laid waste as if by a plague.

I am one of those, perhaps misguided, individuals, who believe that a sound and healthy agricultural industry is vital to the welfare of this country. Furthermore, a prosperous agricultural industry would have such reactions on the demand for electrical equipment of all kinds, feeding stuffs, fertilisers, &c., as would absorb the greater proportion of our unemployed.

For better or worse our destinies are in the hands of politicians. Electrical engineers, comprising so many organised associations, can exert their influence on the politicians to take immediate action to stop the rot in agriculture. If this were achieved, then there would be some hope for young electrical engineers looking for prospects in the sphere of rural electrification. M. W. SINGER.

Edgbaston, Birmingham, *November 5th*.

Multiple Earthing

The views of Mr. F. W. Purse expressed in your issue of November 4th might well be modified to read ". . . . . the subject should be tackled soon, and now is a good time to do it."

The remarks by Mr. T. Wrigley would seem to point to the fact that had the two districts been earthed at more frequent intervals the incidents would not have happened. As these occurred far away and as the system was different it may perhaps be interesting to give a case where the supply end earth-connection was brought quite close to the consumer—a case of single earthing at the supply end only. The consumers in the district had not only lodged many complaints against poor voltage regulation, but many could show about 40 per cent. of the normal supply voltage (at times a red-yellow glow from a 230-V lamp) between the neutral of the house wiring and an accidental earth (also the wireless set earth) in the same house. The distance from the supply end was recently reduced to about one-sixth by the installation of a transformer to serve that part of the district, with the result that regulation is now saisfactory and the voltage gradient between the house neutral wire and the earthed wire in the house has practically vanished.

The voltage gradient to earth to which a rural consumers' installation may be subjected is governed by (a) the effectiveness of the neutral return earth-connection at the supply end; (b) the permanency and value of the effective resistance of the intervening strata (the quality, &c., of which may be far more important than the best earth-connection at the supply end); and (c) the effective resistance of the return conductor (or conductors and earth in the case of multiple earthing " grid "), all of which can be used to best advantage by a system of multiple earthing.

In the absence of a water pipe return and/or a low resistance continuous-earth strata from the supply end to consumers, a multiple earth secondary " grid " is the best and cheapest system so far employed.

As excess current or excess potential to earth is quite as controllable as other classes of faults why outlaw multiple earthing nationally because petty correctable individual faults to earth can occur? Why condemn multiple earthing for the whole country and overlook its advantages to every electricity authority and the 3,000,000 connected consumers because a correctable impedance or current to earth or unbalanced load may become unreasonably high in certain circuits at certain times? Arguments against multiple earthing usually ignore the fact that a faulty, poor, loose, broken, or/and high-resistance earth-connection can occur at the supply end, or that resistance of the earth body between supply end and consumers is high or non-continuous and/or that conditions for good service and best revenue earning are often at their worst on heavy load where the system has a single earth at the supply end only.

As rural distribution lines are generally overhead and exposed to direct and indirect lightning and other hazards, they require the cheapest and most effective method of protection. Years of experience have proved that the best method of giving protection and other desired advantages for the least cost is effective multiple earthing on consumers' premises and/or a multiplicity of earths at the most effective points en route. Compared with overhead lines built in many countries, in this country rural lines enjoy many advantages which favour multiple earthing practice.

I fail to see why the multiple earthing should not be practised in this country where consumers are already familiar with a nearly constant 230 V to earth continuously.

London, S.W.1, *November 5th*. WILLIAM T. TAYLOR.

Wiring by Supply Companies

We read through the Correspondence in the REVIEW every week, and note that very often our kin, that much harassed body of men called electrical contractors, are complaining of shoddy wiring, etc. We do not complain of this, having got beyond it, but of the supply companies and their free-wiring systems. Our latest experience of this occurred to-day when we were told by a client that the supply company was going to do a job at a much lower price. The client informed us that the company's estimate was £5 4s. for the wiring of ten lighting points, complete with lamps, including a 50-ft. run of service cable.

We suggest that instead of complaining of bad wiring, &c., the electrical contractors should get together and see if something cannot be done to stop this.

November 2nd. W. H. T. & Co.

Sprayed Lamps

I have recently been carrying out experiments in connection with internally and externally sprayed lamps for illumination purposes, and as this is a question which I understand is receiving the consideration of the various lamp manufacturers I offer my observations on the results obtained.

I have just concluded on behalf of my Council illumination schemes which have extended over a period of one month. Out of over 1,000 lamps internally sprayed I have only had in that month four " dud " ones. There is no sign after a month's service of cracking or internal blistering and the original colour of the lamp is retained. The externally sprayed lamps with glossy finish are a complete failure and have definitely not stood up to adverse weather conditions. There has been considerable diversity of opinion on the performance of internally sprayed lamps, and in all fairness to this form of manufacture I can only say that they have proved an unqualified success in my case, whilst the externally sprayed lamps have proved a complete failure. I may say that both types have been supplied by members of the Electric Lamp Manufacturers' Association. It will be interesting to know the experiences of other engineers in this direction.

Bingley, Yorks, *November 2nd*. O. G. COOK,
Chief Engineer and Manager, U.D.C. Electricity Works

A Gold-joining Machine Wanted

We require a machine to join the strands at the edges of gold metal braid to give a smooth finish and at the same time to retain its flexible qualities for bracelets and other such purposes.

At present we use gas and hand operation, but we wish to know whether work of this kind could be performed with accuracy and precision by electrical means incorporating jigs and electrodes. We have approached one electrical firm but it has not been able to provide what we want. Can any of your readers help us?

November 9th. GOLDSMITHS.

Meters for Canada

The Ontario Hydro-Electric Power Commission's Meter Department would like to get in touch with British manufacturers of portable single-phase and polyphase indicating watt-meters of sub-standard accuracy. These meters would be subject to fairly strenuous conditions, and would have to be capable of standing a considerable amount of transportation without affecting the accuracy of calibration, and they also must be unaffected by temperature changes.

The meters which we use at present for this purpose are mostly of 5- and 10-A capacity at 100 and 200 V. We would greatly appreciate receiving any descriptive price lists from firms supplying such meters. We are also interested in polyphase watt-hour meters of 5-A capacity (100 V), and any information on these would be welcome at the same time.

Ontario, *October 24th*. H. G. YARRILL.

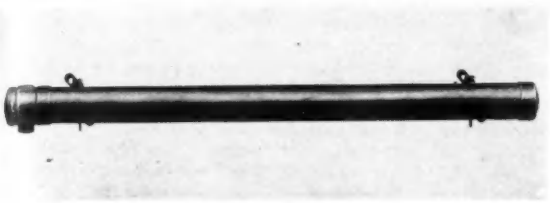
New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

"Unity" Heaters

Alterations have been made to the "Unity" heaters with a view to making them easier to erect, and the terminal ends, brackets and busbars have been entirely redesigned.

The end cap now has a bayonet catch (locked by a screw if desired) which is removed by a twist. The side of the terminal box and connecting nipple can then be removed by



A "Unity" heater

hand. The new busbar is a complete unit. One screw on each heater makes a solid mechanical and electrical connection, and earth continuity is maintained.

The new single bracket is unobtrusive, and the new multiple brackets of both floor mounting and wall mounting types give a vertical adjustment of the whole bracket after fixing of approximately 3 in., although the centres between heaters are fixed. There are no loose parts, and there is one screw for locking each heater in the bracket. Heaters fixed in banks with busbars have the conduit entry vertically at the bottom, and a special elbow can be supplied if the entry has to be horizontal.

The heaters are a product of MESSRS. BARKER, YOUNG & CO., LTD., Unity Works, Welwyn Garden City.

Clock Cases

The "Elo" moulded clock case is a new line brought out by MESSRS. BIRKBYS, LTD., Liversedge, Yorks.

The cases are available with or without the octagonal face shown in the illustration, or alternatively with some other design of front face. They are moulded from "Elo" synthetic resin and can be supplied in variegated colours.

An "Elo" clock case

New M.C. Speaker Unit

A new permanent-magnet moving-coil loud speaker unit has been placed on the market by the MARCONIPHONE CO., LTD., 210, Tottenham Court Road, W.1, at the modest price of £2 7s. 6d., including a universal input transformer with alternative connections for matching to pentode, power, or push-pull outputs, or for direct connection to the speech coil when the unit is used with a receiver having a low impedance output. The chassis is of pressed steel, the cobalt steel magnet has copper-plated pole pieces, and the cone is self-centring. The d.c. resistance of the coil is 7.5 ohms, and its impedance is approximately 10 ohms at 800 cycles. This "Model 95" speaker unit is capable of excellent performance when fitted with a suitable baffle.

A Small Electric Hammer

The K.B. electric hammer has been introduced by the KANGO CO., LTD., Vandon Street, Caxton Street, W.C.1, to provide a lighter hammer than its standard model type "B." The new model, which is particularly suitable for drilling holes in concrete for Rawlplugs up to ¾ in. in diameter weighs only 11½ lb. and is equipped with a robust electric motor rated at 120 W.

The "Kango" hammer

The hammer is designed to give 1,300-1,400 high velocity blows per minute and is driven by a totally enclosed motor especially designed to withstand vibration. The motor rotates a striker through a pair of bevel wheels inside the hammer casing which is attached to the motor.

The large bevel is connected to the striker by a friction clutch which, by allowing a slight slip at each blow, prevents any shock being transmitted to the armature or bevel wheels. The striker hits a pin projecting into the hammer casing and the pin hits the tool socket containing the actual tool through the medium of a recoil member. This in turn prevents the kick-back of the tool damaging any of the parts.

Owing to the high velocity of the blow it is not necessary to press the hammer up to its work, and it is therefore useful for many purposes where the work is not solidly held. In addition to drills, a variety of other tools, *e.g.*, chisels up to 1 in. for masonry or for iron and steel, are available.

The price of the hammer, complete with tool holder, working and dismantling instructions, is £19. Tools are extra.

A Flexible Plug Extension

MESSRS. MCLEOD & MCLEOD, 329, High Holborn, W.C.1, announce the development of a safety sleeve extension piece for irons and cooking and heating apparatus. It is designed to reduce contact pin heating and is available in three types:—No. 1, bent in the opposite direction to the handle of the iron; No. 2, at right angles to the handle; and No. 3, with built-in apparatus plug. Earth connections can also be obtained incorporated in the extension. The price is 1s. 8d. each for gross lots.

A safety extension piece

A Battery Tester

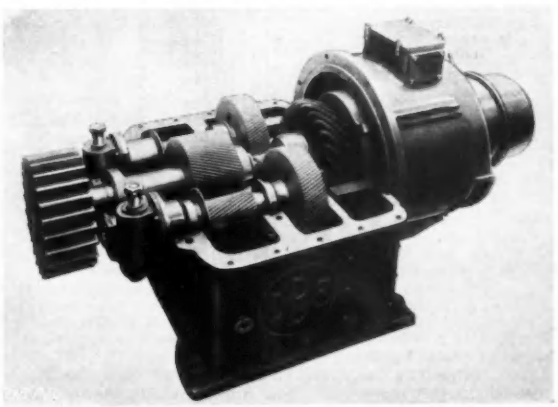
At the recent motor show at Olympia, MESSRS. S. GUITERMAN & CO., LTD., 35-36, Aldermanbury, E.C.2, introduced a new device known as the "Find-A-Leak" inter-cell battery tester designed for use in the battery repairing shops of motor service stations.

The apparatus consists of a specially designed high-voltage induction spark coil operated from a 6-V battery and connected through a milliammeter to a lead-coated gauze plate and lead-coated wire brush which form the positive and negative poles. In use the plate is placed on one side of a cell and the brush on the other. On running the brush over the surface any leaks or weaknesses will be revealed by a spark or series of sparks jumping through from the brush to the plate. The milliammeter also registers the passage of current when a leak is located.

It is claimed that a complete 12-V battery can be tested in five minutes and that the device will also reveal any weaknesses in the insulation.

A Pericentric Helical-geared Motor

Many progressive features are embodied in the latest design of the pericentric helical-geared motor produced by MESSRS. DAVID BROWN & SONS, LTD., Park Works, Lockwood, Huddersfield. The pericentric motor can be fitted with a pinion on the low speed shaft for use on a further reduction. The gearing and the end windings at the driven end are quickly accessible, and the motor end complete with pinion can easily be removed axially without disturbing the gearing. An intermediate gear case wall is introduced so that a bearing can be provided on either side of the low-speed wheel (which has the largest torque to transmit) to ensure proper mating independently of externally imposed thrusts, &c. This wall carries



The David Brown pericentric helical-geared motor

the layshaft bearings and the whole unit is supported on a pair of feet at the end where the torque is greatest.

A balanced arrangement of two layshafts is adopted whereby the low speed wheel is driven by a pinion on either side

of it, thereby neutralising any load on its journals beyond its own weight. In a similar manner a nickel chrome steel rotor pinion drives on to wheels on either side of it and can under these conditions safely be overhung since its shaft is only subject to pure torsion. The two layshafts are free to float and are interconnected externally by a pair of levers pivoted at their centre. Thus the levers take up a position of equilibrium with balanced equal and opposite end thrusts due to the load on the helical gearing. Rubber buffers are incorporated to provide shock absorption. Amply rated ball and roller bearings are employed throughout. Since gear ratios up to about 30 to 1 are obtainable in the standard pericentric motors it is possible to choose the most favourable design speeds for high power factor, overload torque and efficiency of the electrical portion.

" Satchwell " Thermostats

The RHEOSTATIC CO., LTD., Slough, has recently brought out two new " Satchwell " thermostats which are intended particularly for automatically controlled boilers, but can, of course, be applied to industrial and domestic heating.

Type " P " has been designed for clamping on to the riser from the boiler and is supplied complete with clamping straps suitable either for vertical or horizontal pipes from 1 to 6 in. in size. A metal cap protruding through the base of the instrument transmits the heat to the sensitive element. A good metal to metal contact is therefore imperative.

The " Satchwell P " thermostat

The range of the calibration of the instrument is from 100 to 200 deg. F. and the operating accuracy is approximately plus or minus 5 degrees with a rate of change in the pipe of 1 deg. per minute. The capacity of this model is 1 A up to 250 V a.c. or 0.1 A up to 250 V d.c.

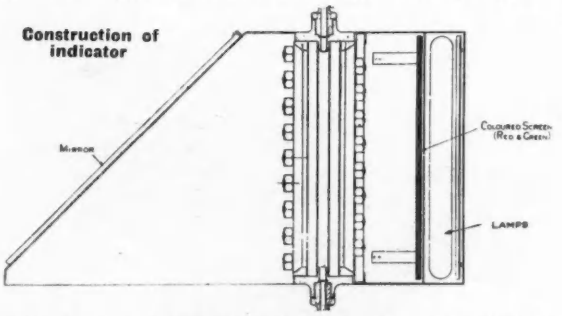
The other new model is type "WPS," an immersion instrument which is available with a stem length of 18, 12, 8½ or 4½ in., giving a temperature range of 80, 140, 170 or 200 deg. F. respectively. The capacity of the " WPS " type is as follows: Resistance loads—15 A up to 250 V a.c. 0.1 A up to 250 V d.c.; repulsion induction motors, ⅓ h.p. 200/250 V and ¼ h.p. 100/120 V; split phase motors, ¼ h.p. 200/250 V and ⅛ h.p. 100/120 V.

For normal use the 8½-in. or 12-in. length of stem is recommended, and special temperature scales can be given where required. The instruments can be set for a closer operating accuracy when used with relays and oil burner panels.

A Bi-colour Water-level Indicator

MESSRS. DEWRANCE & CO., LTD., 165, Great Dover Street, S.E.1, have introduced a transparent water-level indicator which enables a direct reading of the gauge glass, which may be 60 ft. or so above the firing floor, to be obtained at the control panel.

On the boiler side of this indicator are four or five 20-W gasfilled lamps, from which beams of light travel through two

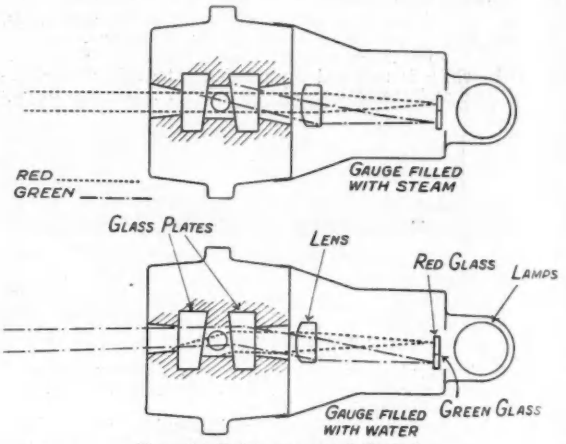


Construction of indicator

strips of coloured glass, one red and the other green, in front of which is a lens of similar length. These are housed in a japanned metal container attached to the indicator, which is of the company's standard pattern, except that the mica-shielded gauge glasses have their inner surfaces ground at an angle to one another.

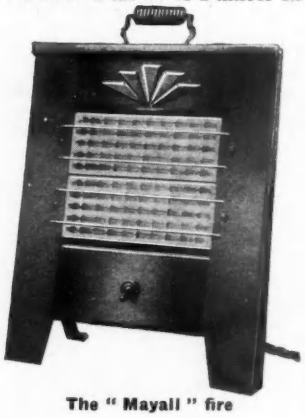
The red beam of light, after passing through the lens, proceeds as a parallel beam, and when steam fills the space between the gauge glasses travels straight through the indicator. The green beam is also projected through the lens, and thence as a parallel beam: as it originates from a point off the centre line it strikes the inside of the body of the indicator, after travelling through the glass and steam space, and is not seen by the observer.

When water is between the gauge glasses it acts as a prism, and the coloured beams, striking the side of this prism obliquely, are bent by refraction. The deflected red beam then strikes the inside of the body and is lost to view, and the



How the light rays are deflected

green beam is deflected into the line of sight. The spaces occupied by steam and water are thus shown in striking contrast. The image of the gauge can be thrown on a mirror and transferred thence to a mirror on the control panel.



The " Mayall " fire

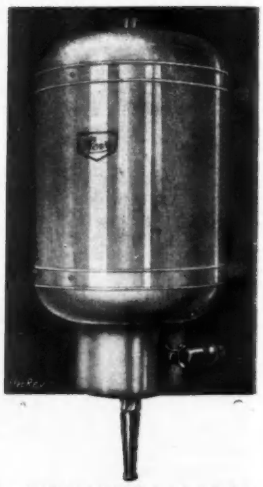
The " Mayall " Fire

A sheet metal fire designed on modern lines and finished in sprayed oxidised copper or silver which is claimed not to chip, has just been introduced by MESSRS. MAYALL AND CO., LTD., 61, Moor Street, Birmingham, and 13, George Street, Nottingham.

The 1-kW model, 14 in. high by 13 in. wide, costs 12s., while the 2-kW model, 16 in. high by 13 in. wide, is priced at 21s. and incorporates a switch. Spare elements can be obtained for 5s. 6d.

" Revo " Water Heaters

The range of electric thermal storage type water heaters made by the REVO ELECTRIC CO., LTD., Britannia Works, Tividale, Tipton, Staffs, has recently been redesigned, and improved in many respects. The range includes standard models for 1½ gals. (£4 10s.); 3 gals. (£6 15s.); 5 gals. (£7 10s.); 12 gals. (£12); 15 gals. (£14); and 20 gals. (£16); larger sizes are supplied if required.



An improved " Revo " heater

The 1½-gal. heater is made in the free outlet type only, and is available for either a.c. or d.c. The other sizes can be supplied for free outlet, or pressure operation, for one or more points of supply. The inner containers are spun from solid copper, welded and tested to withstand a pressure of 120 lb. per sq. in., and the inside is heavily dip-tinned to afford protection against corrosion. Granulated cork is used to insulate the inner container from the outer case, which is made from sheet steel, lead coated on the inside and enamelled on the outside.

The heating unit assembly comprises element, thermostat, inlet and outlet pipes, all mounted on a single base which can be readily withdrawn from the container as a self-contained unit. The element case is made from solid drawn tube of special alloy, which has the desirable characteristic that it resists the sealing action of hard waters.

All fittings are chromium plated and free outlet type heaters are fitted with an anti-drip device. The Revo immersion heaters have also been improved and reduced in price.

Sales Management: The Other Side

THERE is only one right answer to the question, Who shall control the destines of a business? In the ELECTRICAL REVIEW of October 28th Mr. F. C. Tyrrell says that the sales manager is the man claiming that only one who has had experience in commerce and has a commercially trained mind, is fitted for such work. But, what is a commercially trained mind? What is it that fits a travelling representative to become a general manager? Commercial training in its practical sense consists of learning to handle the multitude of papers with which an "over-systemised" office confuses its clerks and dumbfounds its customers! It also consists of learning to deal with customers as they come and in worrying technical staffs for the solution of difficulties arising with customers who, after having asked definite questions, are not to be put off with mere sales letters and catalogues.

The essence of successful selling lies in placing goods so that they remain sold and exist as a standing advertisement for the firms which produced them. Any traveller elevated to executive position can get a quantity of material out of a factory and delivered to places of retail distribution. The country is flooded with such material, much of which will never be sold. Motor cars, radio sets, fittings and like goods are out on show or on sale or return, to the value of thousands of pounds sterling in most of the towns in the country. This, however, is not selling: it is merely clearing the factories and making scrap of material which could have been put to better use in other ways.

A Question of Training

If travelling salesmen and ordinary commercial men are to be ultimately general managers and thus the arbiters of the fate of the undertakings, how are they to be fitted for their jobs? Proper administration or management involves the ability to talk with knowledge and authority about the products of the factory, but where can brains never trained in scientific reasoning acquire this knowledge and experience? Surely not on the road as salesmen, or as clerks! Under what conditions will untrained brains acquire that nicety of distinction which must be exercised in dealing with the affairs of a company in relation to the opening and collection of accounts and keeping the firm on a liquid basis the while? Only mathematical brains can undertake this work of controlling policy successfully.

Further, who is going to tell customers how things work and whether they will operate under stated conditions? At present the query has to be referred to the works and a reply awaited. This, surely is not salesmanship! In a salesman-controlled company it is a matter of impossibility for a company to get into touch with someone who can discuss the technical merits of products.

Most engineers can be made into salesmen in half an hour, but a salesman will never be capable of dealing with technical troubles. Of two men who are after an order, where two things are nearly equal as regards price, etc., it is almost certain that, if one of them is an engineer salesman and the other the usual representative, it is the former who will be most successful and, moreover, he is the man who will keep the goodwill of his customers.

Intimately connected with sales matters is service. Things go wrong, customers complain, sales departments issue their usual letters in reply, and customers often wait in vain for redress. It is no answer to this question for sales managers to ask for more authority, for what would they do with it? They will never be in a position to know what are the basic causes of defects, so they will not be in a position to say what should be done to put them right.

The "Business Engineer"

These are but a few of the difficulties which a general manager has to handle, and unless this man is an engineer with ability to put matters right within and without, little lasting successful selling is possible. Then, however, there would be no need for anyone to call himself "sales manager," since the term would have lost its meaning entirely. Business engineer and manager would be more appropriate.

Many functions which a business engineer and manager alone could perform would work to the betterment of the firm for whom he acted. The works would not be able to bluff him when it came to costs or in dealing with complaints and service; he would not stampede them into making articles having little to recommend them but the colours of their labels; and he would not do business with people who would get his products a bad name, however large a proposed order might appear. He would be received in quarters where salesmen could never go, and he would never be fool enough to run with the hare and then try to hunt with the hounds. His policy would lead to confidence, since he would not countenance quality deterioration or competition with established and reliable retail houses, whilst scroungers after trade terms would soon be heard of no more. Also, he would know in advance, whether a proposed article would be good to sell, since he could read the drawings, so that much money and material would often be saved and diverted into more productive channels.

The world is suffering from severe over-specialisation in both technical and commercial business matters, so that there has grown up a maze of watertight compartments, into which no one can enter, and, what is worse, from which those within cannot extricate themselves. Specialisation leads only to sectional efficiency and away from co-ordinated efficiency.

ROBERT W. MINTER, A.I.E.E.

New Books

Electricity and the Motor Car. By F. H. HUTTON. 6th Edition. Pp. 162. London: Iliffe and Sons, Ltd. 2s. 6d. net.

The fact that Mr. Hutton's work has necessitated no fewer than six editions is the best testimony to its utility in meeting the technical requirements of the ever-growing and changing army of owner-drivers. It is written in simple language, briefly deals with the first principles of electricity, and then covers magnetos. Touching upon sparking plugs, the author refers to the recent introduction of a much smaller type of plug than those generally used. He is not very definite as to the advantages of the new miniature plug as he merely remarks that it is said to be specially suited to coil ignition and to have good qualities in starting and running.

Upon the question of battery *v.* magneto ignition the author confines himself to giving the pros and cons of both systems. Old motorists might not agree with him as to "the choice being chiefly dependent on opinion and on the circumstances under which it is to be used." In modern cars, the purchaser has really no choice but has to accept, with its drawbacks, the battery system of ignition mainly, one fears, because "the system is rather cheaper." The writer himself prefers the magneto although he gives details of the coil ignition system.

Accumulators, lighting, starting, installation and electrical transmission are other subjects included, and an omnibus chapter deals with a variety of current-using motor accessories. the book, which throughout is well illustrated, closes with a useful glossary of electrical terms and an exhaustive index.

"Outline Notes on Telephone Transmission Theory," by W. T. PALMER. 165 pp.; figs. 70. London: The ELECTRICAL REVIEW. Price 5s.

Within a small compass the author has succeeded in giving a fairly comprehensive *outline* of his subject. The book is really a series of notes in seventeen chapters, beginning with the simple classical theory of wave propagation, and ending with its application to the unloaded and loaded telegraph cable. An acquaintance with elementary mathematics is presupposed on the part of the student as a preliminary to the pictorial work which is a prominent feature throughout the notes. Examples are freely interspersed throughout the pages.

A somewhat lengthy "foreword" is devoted to a consideration of the phenomena of transmission from a physical point of view, and a comprehensive bibliography is given at the end of each section to enable the student to amplify his reading beyond what has been given. The book, it is claimed, should prove useful to candidates for the C. and G. Examinations, final B.Sc. (Eng.), of the University of London, the I.E.E. examinations, and for the Civil Service examinations for inspectors and assistant engineers in the Post Office. It is well got up and illustrated.

Hoyer-Kreuter Technological Dictionary. Edited by A. Schlomann. Vol. III: French-German-English. Pp. 719. London: Machinery Publishing Co., Ltd. Perlin: Julius Springer. Price £5 10s.

This is the sixth revised edition of this work since the first was published twenty-eight years ago. It deals with all branches of engineering, science, and commerce. The two previous volumes, German-French-English and English-German-French, were reviewed earlier this year, and each gives the translation of some 100,000 words that cannot be found in a general dictionary. The work has been very well arranged and is printed in Latin characters which considerably simplifies reference for the non-German user, and in spite of the rather high price it is very good value.

Shorter Notices

The *Wireless and Gramophone Trader* Year Book and Diary for 1933. Pp. 406. London: The Trader Publishing Co. Price 5s. 6d. post free (3s. 6d. to subscribers to "Trader" journals).—This is the ninth year of publication and new firms and products which have appeared during the year have been included, while the "Goods Supplied" section has been extended by the addition of new headings covering not only radio apparatus

but equipment and fittings. A section giving concise specifications of standard receivers has been introduced, while the directory of supply mains voltages (compiled in conjunction with the ELECTRICAL REVIEW) has been revised

"Newnes Engineering Practice." To be completed in about 48 weekly parts, 1s. each.—This new work deals with all branches of mechanical engineering including steam, automobile and marine engineering, power generation and engineering workshop practice. Whilst the work has been designed for those engaged in engineering works, it is also intended to be directly useful to engineers in charge of industrial plant. It deals with every type of mechanical operation from the making of a surface plate to the installation of a Diesel engine—a very ambitious undertaking.

"Marryat-Scott Lift Maintenance Manual." Pp. 48; figs. 15. London: Marryat & Scott, Ltd. Price 10s.—In compiling this manual an attempt has been made to give in concise form all the information normally required for the efficient maintenance of standard Marryat-Scott lifts, including instructions with regard to lubrication and adjustments. An index has been provided to facilitate quick reference to the various portions of the equipment which requires attention from time to time.

"British Patents and Designs Statutes." Pp. 126. London: Stevens & Sons, Ltd. Price 4s. 6d.—This book has been compiled to fill the need for something more than the Acts as published by the Stationery Office, which do not contain an index or references to alterations and amendments, and something less than a text book. The principal alterations brought about by the 1932 Act are included, and also the amended Acts of 1907-1932. The introduction and index are by Mr. H. J. W. Bliss, B.A., F.I.C.

"Graphs of Standard Mathematical Functions," by H. V. Lowry. London: Sir Isaac Pitman & Sons. Price 2s. This book contains 64 graphs of powers of x, and trigonometrical, exponential, logarithmic, hyperbolic, and inverse functions.

Great Britain's Electrical Exports in 1931

THE annual statement for 1931 of the export trade of the United Kingdom has recently been published. It gives under a much more detailed classification than the monthly accounts the countries of destination of goods shipped. From this statement have been extracted the following figures showing the values of the principal items of electrical goods and apparatus and machinery exported last year, together with the increases or decreases compared with 1930:—

	1931. £ (Thous.)	Inc. or dec. as compared with 1930.
Wires and cables, rubber insulated (not telegraph or telephone)—		
Total	692	– 542
To India	143	– 76
„ South Africa	127	– 25
„ Australia...	81	– 230
„ New Zealand	46	– 43
„ Irish Free State	38	– 1
„ Argentina	36	– 41
„ China	27	– 11
„ Greece	17	+ 13
„ Portuguese E. Africa	16	– 9
„ Persia	3	– 9
Wires and cables, insulation other than rubber (not telegraph or telephone)—		
Total	724	– 957
To India	186	– 104
„ South Africa	148	– 11
„ Australia...	96	– 350
„ New Zealand	39	– 31
„ Portuguese E. Africa	36	– 17
„ Argentina	33	– 240
„ China	14	– 21
„ Uruguay	7	– 51
„ Irish Free State...	3	– 2
Telegraph and telephone wires and cables (not submarine)—		
Total	469	– 359
To Argentina	82	– 72
„ New Zealand	56	– 13
„ South Africa	52	+ 10
„ China	46	– 11
„ India	42	– 13
„ Rumania...	18	+ 18
„ Australia...	17	– 101
„ Brazil	13	– 68
„ Egypt	6	– 38
Submarine telegraph and telephone cables—		
Total	169	– 634
To United States	46	– 176
„ France	44	– 12
„ Denmark	39	– 17
„ Italy	7	– 347
„ Canada	3	– 29
Radio receiving sets (except valves)—		
Total	96	*
To Irish Free State...	32	
„ South Africa	6	
Radio transmitting apparatus (except valves)—		
Total	174	*
To Italy	30	
„ British E. Africa	19	
„ India	18	
„ Arabia	14	
„ S. Rhodesia	14	
Radio valves—		
Total	263	– 49
To France	45	– 8
„ Australia...	40	– 22
„ Belgium	24	+ 5
„ Irish Free State	18	+ 5
„ Argentina	15	+ 4
Other radio parts and accessories—		
Total	336	*
To Italy	48	
„ Irish Free State...	29	
„ Netherlands	26	
„ India	25	
„ Belgium	22	
„ France	22	
„ South Africa	20	
„ Australia...	14	
Ignition magnetos—		
Total	16	– 12
Other telegraph and telephone instruments and apparatus—		
Total	1,195	*
To S. Africa...	257	
„ Argentina	132	
„ Australia...	56	
„ Poland	56	
„ India	55	
„ Canada	51	
Lamps, 20-V and over, gas-filled—		
Total	190	– 122
To India	38	– 2
„ South Africa	29	+ 2
„ New Zealand	26	– 1
„ Australia...	25	– 99
„ Irish Free State...	21	– 5
„ Argentina	10	– 5
Lamps, 20-V and over, other—		
Total	141	– 112
To India	33	+ 1
„ Australia...	26	– 81
„ New Zealand	23	– 8
„ South Africa	22	– 6
Batteries, primary, for flash lamps—		
Total	18	+ 6
Other primary batteries—		
Total	108	– 43
To South Africa	21	+ 7
„ Irish Free State	18	+ 4
„ India	16	– 8
Accumulators, portable—		
Total	321	– 42
To India	64	+ 12
„ Canada	40	– 29
„ Denmark	40	– 6
„ Irish Free State	23	– 2
„ South Africa	12	+ 2
„ New Zealand	6	– 2
„ Australia...	4	– 10
Accumulators, stationary—		
Total	257	– 108
To India	54	– 67
„ Netherlands	40	+ 18
„ S. Africa	24	+ 7
„ Irish Free State...	22	+ 6
„ Belgium	16	– 7
Lighting accessories and fittings, including switches—		
Total	378	– 222
To India	78	– 22
„ South Africa	53	– 8
„ Irish Free State...	44	– 11
„ France	24	– 7
„ New Zealand	22	– 30
„ Argentina	14	– 23
„ Australia...	14	– 55
„ China	9	– 1
„ Spain	3	– 9
Ammeters, voltmeters, etc.—		
Total	102	– 36
To India	21	– 8
„ South Africa	13	– 4
„ Australia...	7	– 17
House service meters—		
Total	126	+ 16
To Greece	45	+ 44
„ South Africa	14	+ 2
„ India	12	– 10
Switchboards, other than telegraph and telephone—		
Total	37	– 52
To South Africa	8	+ 1
„ British India	7	– 7
Electrical goods and apparatus, not elsewhere specified—		
Total	1,375	– 612
To India	274	+ 4
„ Argentina	121	– 68
„ South Africa	120	– 17
„ Sweden	78	– 1
„ Irish Free State...	71	– 29
„ France	64	– 27
„ Italy	56	+ 1
„ New Zealand	54	– 52
„ Australia...	38	– 69
„ United States	24	– 80
„ Brazil	6	– 78
Total of electrical goods and apparatus—		
Total	7,438	– 4,490
To Sweden	162	– 17
„ Belgium	151	– 22
„ France	286	– 74
„ Italy	194	– 366
„ Argentina	480	– 532
„ Irish Free State	371	– 31
„ South Africa	954	+ 125
„ Australia...	435	– 1346
„ New Zealand	379	– 221
Generators, a.c.—		
Total	765	– 111
To Soviet Union	194	+ 104
„ Netherlands	159	+ 130
„ India	76	– 28
„ Canada	61	+ 10
„ South Africa	51	– 6
„ Australia...	23	– 68
„ New Zealand	3	– 45
Generators, d.c.—		
Total	270	– 33
To India	67	– 34
„ South Africa	30	– 2
„ Canada	19	+ 9
„ Australia...	12	– 8
Motors, railway and tramway—		
Total	81	– 101
To Argentina	49	– 7
„ India	7	– 69
„ Brazil	1	– 19
Motors, other, a.c.—		
Total	521	– 198
To India	56	– 59
„ Canada	55	– 55
„ South Africa	53	– 9
„ New Zealand	22	– 26
„ Australia...	20	– 49
„ Irish Free State	17	– 5
„ France	16	+ 1
„ Netherlands	7	– 23
Motors, other, d.c.—		
Total	206	– 170
To India	30	– 27
„ France	21	—
„ South Africa	18	– 11
„ Australia...	15	– 22
„ Argentina	13	+ 1
„ Canada	10	– 35
Convertors and transformers, rotary—		
Total	42	– 138
To India	8	– 11
„ Australia...	—	– 52
Convertors and transformers, static—		
Total	369	– 373
To Canada	71	+ 20
„ New Zealand	57	– 38
„ South Africa	39	– 47
„ India	36	– 26
„ Hungary	20	– 7
„ Soviet Union	7	– 83
„ Argentina	6	– 23
„ Palestine...	6	– 25
„ Spain	6	– 28
„ Australia...	2	– 73
Control and switchgear—		
Total	1,365	– 85
To Argentina	81	– 60
„ China	75	+ 34
„ Netherlands	47	– 21
„ France	36	+ 6
„ Soviet Union	38	– 74
„ Uruguay	18	– 76
„ Japan	11	– 13
„ Brazil	10	– 35
Vacuum cleaners—		
Total	33	+ 1
To Irish Free State	17	– 3
Electrical machinery not elsewhere specified—		
Total	689	– 247
To India	144	– 56
„ Soviet Union	61	+ 29
„ South Africa	57	– 15
„ France	36	– 2
„ Argentina	34	+ 1

* No comparative figures.

Parliamentary News (BY OUR SPECIAL REPORTER)

DURING the Committee stage of the Ottawa Agreements Bill Mr. Cocks, a Labour member, moved to omit copper from the agreements. He said that the proposed duty on copper would about double its price, and that would not be very satisfactory to users of copper here. If electric cable makers and other users of copper had to pay twice as much for their raw material in competition with other copper users abroad who got their copper tax free it would hamper the British exporter of manufactured articles in which copper was used.

Mr. Harcourt Johnstone, supporting the amendment, said that copper was an important raw material. The world production of copper was about 1,500,000,000 tons, and of that amount about 150,000,000 tons was used in this country, and approximately two-thirds of this was electrolytic copper, of which the Dominions were unable to produce substantial quantities of the quality required.

Mr. Hore-Belisha, Financial Secretary to the Treasury, said that the Ottawa Agreements provided for a duty on foreign unwrought copper of 2d. per lb.; that was on copper in its raw material state, to be used by other industries—the cable-making industry, the electrical industry, and the brass industry. Clearly, the Government would not have undertaken to put this duty on foreign imported copper unless they were satisfied that resources existed in the Empire for replacing what now came from abroad, and unless they were satisfied that the users of copper would get what they required, not only in ample quantity but in reliable quality and at a satisfactory price. In order that their plans should work smoothly, the President of the Board of Trade had called the consumers and producers in the industry together, at which 90 per cent. of the whole industry was represented. They reached an agreement, and they said: "The intention being to ensure a progressive change-over from non-Empire to Empire copper, the consumers agree to give every possible assistance to the producers, including the maintenance of a technical committee in which representatives of the producers will be welcome for the study and discussion of the problems arising in their endeavours to satisfy consumers' requirements in respect of quality, and, further, they will, from now on, as far as lies in their power, purchase from Empire producers in preference to non-Empire suppliers."

They had agreed to adopt as the "world price" the London Metal Exchange quotation for copper, exclusive of duty, it being understood that if separate quotations were in future to be made for Empire copper and non-Empire copper, the latter quotation should be adopted for the purpose of the agreement. Finally, the trade had undertaken to accept the principle that United Kingdom consumers should not be at a disadvantage as compared with foreign consumers. This was a most promising outcome of the Ottawa Conference.

The amendment was rejected by 220 votes to 50.

The Battersea Power Station

On November 2nd Mr. D. G. Somerville asked the Minister of Transport if he would state when the new power station at Battersea would be completed, and whether any reduction in London electricity charges might be anticipated subsequent to that date.

Mr. Pybus said he understood that the new station would probably be opened in the summer of 1933. It would be operated in conjunction with the grid system for South-East England, and it might be anticipated that consumers of electricity would, in due course, benefit from economies in generation effected by that system.

Electrical Interference with Radio Reception

On November 3rd Captain Ian Fraser asked the Postmaster-General if, in view of the recent demonstration by the Post Office at the National Radio Exhibition that practically all kinds of electrical interference with wireless reception could now be inexpensively prevented, he would take the first opportunity of securing power to enforce the reasonable use of interference-preventing apparatus.

Sir E. Bennett, the Assistant Postmaster-General, said that the desirability of introducing such legislation would be considered in connection with any amendment of the law which might be necessary as the result of the deliberations of the International Radio-telegraph Conference now in session at Madrid.

Legal

A Radio-valve Specification Amended

In the Chancery Division last week Mr. Justice Eve had before him the case of the Mullard Radio Valve Co., Ltd., v. Lissen, Ltd., and others, on a motion by the plaintiff company of leave to amend the complete specification on which their letters patent No. 287958 were granted by way of disclaimer, correction and/or explanation as indicated in the copy of the specification which had been delivered.

The patent related to valves for use in radio-telegraphy and was applied for and granted to Mr. Harold Wade for "improvements in or relating to circuit arrangements and discharge tubes for amplifying electric oscillation by means of thermionic devices." The invention was based on providing means which ensured that when the anode potential fell the increase of the screening grid current at the expense of the anode current would be substantially avoided.

Mr. Moritz, K.C., for the plaintiffs, said that his clients were registered owners of the patent. The action which the plaintiffs had brought against Messrs. Lissen, Ltd., for alleged infringement of the patent, had been settled and Messrs. Lissen disappeared from the present proceedings. There were three defendants to an action of an exactly similar character, Messrs. Pearl and Moore, the William Lighting Co. and Bristol Radio Supplies, who now appeared as opponents to the proposed amendment, and therefore the decision in the one case would probably govern them all. Counsel then dealt at length with the technical details of the several amendments which the plaintiffs desired to be made.

Mr. Whitehead, K.C., opposed these amendments, contending that if they were allowed it would mean that the invention would be different from that claimed in the specification.

The hearing was resumed on November 3rd, when, at the conclusion of the arguments, his Lordship allowed the amendments and gave Counsel for the objector leave to appeal if he thought it necessary. His Lordship said that he thought that the application to amend was a perfectly bona fide one.

Two Osram Lamp Actions

In the Chancery Division on November 4th Mr. Justice Farwell had before him an action brought by the General Electric Co., Ltd., against Price and Stores on a motion by the plaintiff company to restrain the defendants until the trial of the action, or further order, from passing off lamps as genuine "Osram" lamps.

Counsel for the defendants said it was a case concerning the sale of second-hand lamps. The plaintiffs alleged that these lamps had been sold as genuine "Osram" lamps, and he (counsel) was prepared until the date of the trial to give an undertaking not to use an "Osram" lamp card in connection with the sale of second-hand lamps or to sell second-hand lamps as new. Counsel for the plaintiffs said that they wanted to prevent second-hand lamps being sold as genuine "Osram" lamps.

On the undertaking given on behalf of the defendants his Lordship made no order on the motion.

On the same day Mr. Justice Eve heard a motion by the General Electric Co., Ltd., against Evelyn Ayres in which, said Mr. R. E. Shelley, who appeared for the plaintiffs, the defendant had agreed to submit to a perpetual injunction restraining the sale of second-hand "Osram" lamps as genuine "Osram" lamps, to deliver up all offending cartons in her possession, and to undertake not to sell any second-hand lamps remaining in her possession. Mr. Shelley said that in the circumstances the plaintiffs did not ask for costs or damages.

His Lordship made the necessary order.

Winding-up Petitions

On Monday last Mr. Justice Bennett, sitting in the Companies' Court, had before him a petition for the compulsory winding up of Edison Bell, Ltd., and it was adjourned until the first petition day in next sittings, when, it was stated, a scheme of arrangement would be ready for presentation to the Court for its sanction.

Mr. Harman, who supported the petition, said the scheme depended upon the underwriting of an issue of capital for a new company, and the arrangements were not so forward as was anticipated.

Mr. Andrew Clark, for the company, asked for an adjournment, saying that by the beginning of next sittings the underwriting was expected to be complete.

On the same day Mr. Justice Bennett heard a petition for the compulsory winding up of Victory Valves, Ltd. The matter now came on for hearing with witnesses from the Manchester District Registry.

Mr. Turner said this was a conflict between two of the largest creditors, but arrangements had now been reached which were satisfactory. It was agreed that the petition should be dismissed.

His Lordship ordered the petition to be dismissed, the costs to be paid out of the assets in the voluntary liquidation.

An Electric Stock Exchange Price Board

Apparatus for the automatic listing of stock exchange quotations has recently been installed in the Svenska Handelsbanken in Stockholm by the L.M. Ericsson Telephone Co. The new device consists of large boards on which the quotations are automatically listed as the prices of the day are set in the stock exchange. The apparatus is manipulated from a central sending desk, where a person by means of electric buttons gives the various rates as well as the differences in comparison with previous quotations, all of which appear in luminous figures on the boards placed in different departments of the bank. The sending desk is in constant telephonic communication with the stock exchange.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources, Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Cheaper Wires and Cables

Reductions in the selling prices of rubber-insulated wires, cables, and flexible cords are announced by members of the Cable Makers' Association. Trade discounts, rebates, and cash discounts remain as hitherto, but special net prices have been introduced for single, twin, and three-core "Nonazo"/"Vinazo" lead-covered and t.r.s. cables in the sizes generally used for house wiring.

An Aid to Theatrical Producers

Mr. Dudley Pearmain, who is producing "Hawk Island" for the G.E.C. Dramatic Society, has introduced an innovation which is believed to be unique in the history of the amateur stage. A rehearsal of the play has been filmed by A. & B. Film Productions using G.E.C. studio lighting equipment, and

Films are being taken to assist in the production of the G.E.C. Dramatic Society's performance of "Hawk Island"

the film shown to the cast at a subsequent rehearsal. The players thus have an opportunity of seeing themselves as others see them, and the producer's task of correcting careless gestures and ungainly movements is considerably facilitated.

Conditions in Portugal

Until the middle of 1931 Portugal was little affected by the constantly increasing world-wide depression, says a Department of Overseas Trade report on economic conditions in that country. Portugal is essentially an agricultural country; the population lives on its own production, and pays largely for imports with products with which the rest of the world offers relatively little competition. Last year imports of electrical generators, motors, etc., amounted in value to 8,080,000 escudos (escudo=4s. 5½d. at par), as compared with 9,732,000 escudos in 1930. The value of lamps imported increased from 8,076,000 to 8,348,000 escudos, but there was a decline from 10,655,000 to 6,383,000 escudos in imports of wire and insulators. The market for radio receivers is largely in the hands of American firms, but British manufacturers are responsible for about 50 per cent. of the component parts.

New Hull Lamp Works

A visit was paid recently by the Lord Mayor of Hull to the new lamp works which have recently been opened by the Insular Electrical Glowlamp Works, Ltd., in New Cleveland Street, Hull. In his address of welcome Mr. A. L. G. de Kanter, managing director, said that the plant was not yet complete, and within two or three weeks further machines would reach the works and enable them to increase their production of lamps of the higher wattages. The works at the moment provide regular employment for forty persons.

Change of Name

The Star Lamp Manufacturing Co., Ltd., Africa House, Kingsway, W.C.2, has changed its name to Atlas Lamp Manufacturing Co., Ltd.

The Swedish Radio Market

A report on the trade in radio apparatus in Sweden has been issued by the Department of Overseas Trade to firms whose names are entered on its Special Register. British firms wishing to obtain copies should apply to the Department, 35, Old Queen Street, S.W.1, quoting reference number A.X.11555

Electrical Production in America

Below are given figures published in the *Survey* of the National Electrical Manufacturers' Association relating to orders reported by various members for the month of August, the figures for the corresponding month of last year being given in parenthesis:—A.c. generators (1-200 h.p.), $632,250 ($1,580,332); d.c. generators (1-200 h.p.), $134,651 ($299,081); fractional h.p. motors, $693,108 ($1,661,505); indoor power switching equipment, $22,064 ($48,707); outdoor power switching equipment, $48,058 ($175,629). In most cases more companies sent in reports this year than last.

Austrian Electrical Imports and Exports

The value of imports of electrical machinery and apparatus into Austria during the first half of the current year was 9,951,000 schillings, as compared with 16,054,000 schillings in the first half of 1931. Exports during the same period totalled 18,930,000 schillings, as against 28,757,000 schillings.

The Electricity Supply Rifle League

The results of the October matches of the First Division of the Electricity Supply Rifle League were as follows:—London Power Co. 582, Shoreditch "A" 576; London Power Co. "A" 585, Blackwall "A" 563; City "A" 589, L.P. Co. "A" 587; City "A" 581, Shoreditch "A" 578; City "A" 589, Blackwall "A" 587; City "B" 582, Shoreditch "A" 576. The City "A" team heads the league table with 14 points, deposing the L.P. Co. "A" team, which has held the championship for the past eight years. In the second division Blackwall "B" won the shield with a total of 12 points, Barking "B" winning the shield in the third division with 21 points.

Radio Valve Manufacture in Italy

The Marelli motor car concern of Milan, which is already in the Italian market with radio apparatus, is now about to begin the manufacture of radio valves under the protection of the high import duties. For this purpose the company has formed at Milan a subsidiary company with a capital of 10,000,000 lire.

The s.s. "Ferranti"

In memory of the late Dr. Ferranti, the London Power Co. has named its new coal-carrying boat, which was launched last week at the Burntisland shipbuilding yards, the s.s. *Ferranti*, and the launching ceremony was performed by the wife of Mr. V. Z. de Ferranti, son of Dr. Ferranti, and the present chairman of the company. The late Dr. Ferranti was at one time chief engineer to the London Electric Supply Corporation, which is now merged with the London Power Co.

E.D.A. Calendars for 1933

Two calendars for 1933 have been prepared by the British Electrical Development Association. Calendar No. 1 (E.D.A. 1068) shows a diminutive housemaid armed with an electric vacuum cleaner, iron and kettle, with an electric fire in the background, and the slogan "Electricity—The Maid-of-all-Work." No. 2 (E.D.A. 1070) shows a nursery, into which an atmosphere of warmth and comfort has been introduced with the aid of electric lighting and heating. Space is provided on the calendars for overprinting the names and addresses of electricity supply authorities or electrical dealers.

New Dutch Company

A new company has just been formed at The Hague with a capital of 500,000 guilders and the title of the Nederlandsche Siemens Maatschappij. Half the capital is being found by the Siemens-Schuckert and Siemens & Halske companies of Berlin and the rest by a number of Dutch financiers.

French Radio Imports and Exports

An official return lately to hand shows that the imports of radio apparatus, excluding valves, into France during the six months ended with June last attained a value of £557,325, as compared with £607,670 in the corresponding half of 1931. During the same period there was also a decline in the exports of radio material from France—from £206,905 to £82,520.

An Electrical Exhibition at Southend

An electrical exhibition is to be held at the Kursaal, Southend-on-Sea, from February 19th to March 3rd next.

Works Extension by Nelco, Ltd.

The extension of the works of Nelco, Ltd., at Shalford, near Guildford, was formally opened on November 4th, when a banquet, followed by a dance, was held, at which about seventy were present. The guests had an opportunity of inspecting the products of the company, which include fractional h.p. universal motors with speeds up to 15,000 r.p.m., battery-propelled trucks and invalid chairs, and portable tools. The new machine shops have a clean lay-out and are well lighted. Mr. L. Murphy (managing director) presided at the function. Proposing the health of "The Guests," he expressed the view that the craftsman was not dead but was the equal of his predecessor of thirty years ago, and referred to the happy relations that existed between officials and workmen in his company. Mr. Watkin (British Vacuum Cleaner & Engineering Co.) said that 15,000 people were employed on the products of his firm, which owed much to the efficiency of the high-speed motors made by Nelco, Ltd., at its Shalford and Maidenhead works.

E.D.A. Visit to the English Electric Works

The North Midland Area Committee of the British Electrical Development Association, accompanied by about fifty engineers from a wide area, visited and inspected the works of the English Electric Co., Ltd., at Bradford, last week. The party was guided by Mr. L. G. Sargeant, managing director of the Bradford works, assisted by Messrs. W. A. Gillott and C. A. Hazeltine. The principal feature exhibited to the visitors was the new section devoted to the manufacture of domestic apparatus. During the past nine months 8,000 fires have been turned out and the weekly output of cookers is fifty. The turnover is rapidly developing, and extensive alterations of the premises are in hand to cope with the expected development. The company entertained the visitors to tea, after which Mr. T. Roles, chairman of the Committee, thanked the company.

Irish Free State Electrical Imports

A quiet tone prevailed in the electrical trade in the Irish Free State during September last, the imports of electrical machinery, fittings, and apparatus during the month amounting to £48,078. The total for the nine months is, however, still slightly in advance of the figures for the corresponding period of last year. The details of the nine months' imports are appended :—

	First nine months 1931.	1932.
	£.	£.
Electrical machinery	138,878	133,327
Electric wires and cables	70,025	86,074
Radio sets and parts	72,928	108,965
Electric lamps and parts	44,277	37,761
Other electrical goods	142,122	112,789
Copper wire	14,969	7,296
Totals	£483,199	£486,212

Social Event

The Electric Construction Co., Ltd., held its annual staff dinner on November 4th at the Victoria Hotel, Wolverhampton. In addition to the heads of departments and their staffs, those present included Messrs. James Gray (chairman and managing director), W. M. Furniss (manager and director), and G. Spencer Hawes (director). Mr. Furniss took the chair at the dinner. Proposing the toast of the company, Mr. H. Jones (works superintendent) mentioned that this was the company's jubilee year. The founder of the business was Mr. Thomas Parker, and he was later joined by Mr. Elwell, the two establishing the firm of Messrs. Elwell-Parker, Ltd. In 1889 the Electric Construction Corporation was founded with a capital of £500,000, and the present works at Bushbury was then erected. In 1893 the Electric Construction Co. was formed. Responding, Mr. James Gray spoke of the sound financial position of the company, and expressed satisfaction at the way they were successfully passing through the acute depression. Messrs. J. M. Boyd (switchgear engineer), Furniss, and Hawes also spoke.

A Switchgear Works Extension

The expansion of its business in the past year or so has led Standard Switchgear, Ltd., to embark upon an extension of its works at Hornchurch, Essex. A picture of the extension now in course of construction is reproduced herewith. We also show one of the latest jobs carried out by the company—a switchboard supplied to the new Surbiton pumping station of the Metropolitan Water Board.

The Timber Trade

Business in the European and Canadian softwood market during the past month has been restricted on account of the bad state of the building demand, but it is becoming more evident that consumers' stocks are dwindling, and that buyers will be forced to come into the market on a larger scale for fresh supplies. The spot market is inclined to be firm. Smaller supplies of American hardwoods are arriving on a higher price level, and comparatively large quantities of Japanese and European oak are being purchased. British Empire mahogany logs continue to be preferred to foreign wood of that description; imports of the former are increasing, whilst the price trend is better than for long past. Plentiful supplies of plywood have been coming into the country and stocks are large.

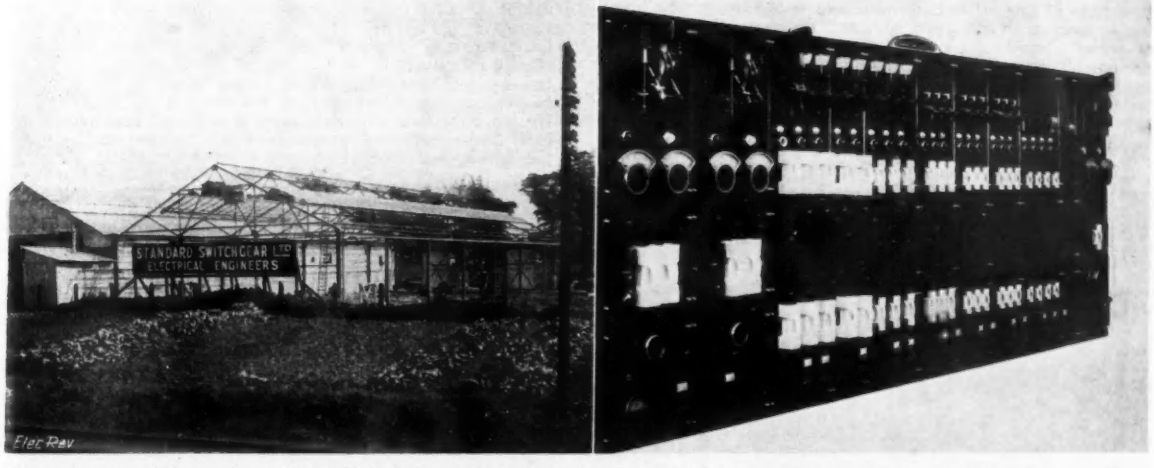
The F.B.I. Business Forecast

A warning against premature optimism is contained in the *Business Barometer*, published by the Federation of British Industries. The business forecast for the fourth quarter of the year says that it is widely believed that because the public morale of the United States has recovered from the panic of last spring and the complete financial breakdown in Central Europe has been stayed, it can be assumed that a revival of international trade is under way. At the moment there are no firm grounds for assuming that these local developments can of themselves have more than a temporary influence on the international situation. The improvement in the prices of certain commodities and stock market securities which has accompanied them, is in part due to the inflationary measures put into operation in the United States, while the more recent inflation in Germany has doubtless contributed to maintaining it. Practically the only active steps so far taken to resuscitate international trade have been those taken on the initiative of this country, and these cannot be expected to fructify immediately. Our domestic trade, however, should maintain its recent improvement.

Putting the finishing touches on the new "Exide" clock which has been erected outside the Chloride Electrical Storage Co.'s Manchester premises. Similar clocks are being installed at other of the company's provincial branches

Recent Contract

A contract has been received by Standard Telephones & Cables, Ltd., from the G.P.O. for the supply, laying, jointing, and testing of an underground trunk telephone cable between Dundee and Perth, a distance of 21 miles. The cable will be of the composite star quad type and will consist of 104 pairs of 20lb. conductors and 74 pairs of 10lb. conductors. About 16½ miles will be armoured and laid direct in the ground, the other 4½ miles being installed in conduits. The cable is to be loaded at intervals of 2,000 yards, and the company will supply the necessary loading coils, which will be installed by Post Office engineers.



The extension of the works of Standard Switchgear, Ltd., Hornchurch, and (right) equipment recently made by the company for the Metropolitan Water Board

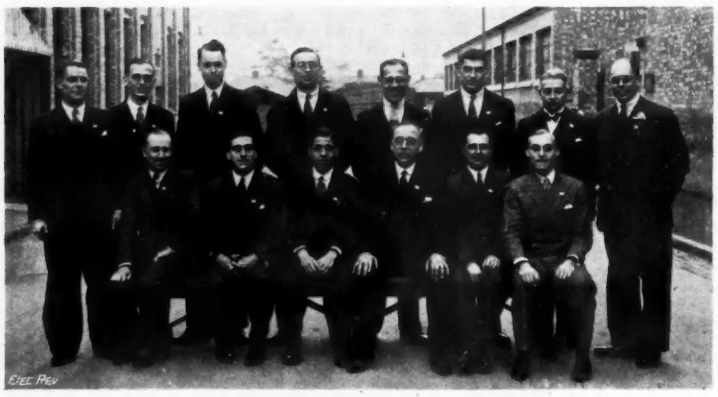
Trade Announcements

The sales side of the Park Royal Engineering Co., Ltd., has been transferred to Bush House, Aldwych, W.C.2.

Messrs. C. Gilbert & Son have moved from 3 to 14a, Shouldham Street, Crawford Place, W.1.

B.S.S. for Lamps for Railway Signalling

The fourth of the series of British Standard Specifications for electric railway signalling equipment has just been issued; it covers electric lamps. Numerous tests to ascertain whether a comparatively small range of lamps could replace the existing types without sacrificing visibility, reliability, or efficiency have proved the practicability of standardisation, with the result that the new B.S. Specification provides a comparatively small range of lamps designed to meet every possible signalling requirement. The general clauses defining the tests on the lamps are in line with the corresponding clauses of Specification No. 161. Special clauses deal with the suitability of the various lamps for particular signalling purposes, and then follow schedules giving the rating, dimensions, efficiency, and life of the lamps. An appendix shows in graphical form the relation between the voltage, life, and efficiency of the lamps. Copies of this specification (No. 469-1932) may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d., post free.



Some G.E.C. Radio Experts

Standing (left to right): Messrs. J. T. Allen, C. J. Poole, H. W. H. Collings, F. L. Marshall, C. C. Warren, J. Preston, S. Johnson and F. S. Dommen. Seated: Messrs. C. E. Brewer, L. Ashman, A. E. Foster, E. A. Joyce, S. F. Mayhew and E. B. Joyce.

The Architectural Association

The programme of the Architectural Association for the forthcoming session has just been issued. The meetings will be held at the Association's premises, 34-36, Bedford Square, W.C., and among the addresses to be given is "The Electric Grid Supply and its Purpose," by Sir Andrew Duncan, on February 27th.

New West-End Showrooms

Messrs. Greene, Phillips & Co., who are now sole distributors of the "P.H." convector, have this week opened extensive and attractive showrooms at 45, Berners Street, W.1. A display window covers nearly the whole of the 30-ft. frontage, and is backed by the main showroom extending about 120 ft. to a suite of smaller rooms and offices at the rear. The building is more than 200 years old, and some excellent examples of period ornamental plaster work have been carefully preserved. The semi-indirect ceiling lighting fittings and wall brackets, which were specially designed by the Bective Electrical Co., Ltd., who carried out the electrical installation work, have plaster-work frames ornamented in the same style as the architecture. The premises are, of course, heated by "P.H." convectors.

Display novelties include a corner setting for a nursery with a built-in convector, and a structure for backing on to any wall, incorporating, besides the convector, small cocktail cupboards, book shelves, and niches about the warming equipment.

Retailers Visit the G.E.C. Radio Works

A party of about 350 radio retailers from London and the South of England travelled by special train to Coventry on November 3rd to inspect the manufacture and assembly of G.E.C. radio sets, loud speakers, &c., at the wireless apparatus works of the General Electric Co., Ltd., Coventry. After touring the various manufacturing shops and assembly and testing departments, the visitors gathered in the works' ballroom to examine a selection of radio products, telephone equipment, and moulded components. At tea, Mr. H. W. Roberts, sales manager, reminded the gathering that the company had always upheld fair trading conditions and respected the position of the retailers, who were the people who really knew what the public wanted. Mr. H. P. Wells, general manager, radio works, expressed the hope that the visit would be profitable as well as interesting, and that it would serve to cement the company's relations with the retailers, whom he was sure would appreciate the wisdom of backing a firm "which was here yesterday, is still here to-day, and would be here to-morrow also." It was the company's constant endeavour to encourage the promotion of the radio trade through the regular channels. Luncheon and dinner were served on the special saloon train

A Synchronous Clock Conference

The following leading British manufacturers of synchronous electric clocks have formed a Conference:—The British Sangamo Co., Ltd., English Clock & Watch Manufacturers, Ltd., Synclocks, Ltd. (Everett, Edgcumbe & Co.), Ferranti, Ltd., the General Electric Co., Ltd., Smith's English Clocks, Ltd., the Synchronome Co., Ltd., and the Telephone Manufacturing Co., Ltd.

The objects of the Conference are to popularise the use of synchronous electric clocks, to foster the interests of the industry, to promote fair trading and to protect manufacturers, traders, and the public, against the evils of irregular trading. The clocks manufactured by members will conform with the requirements of the British Standards Institution, and will be standardised as far as possible in many important details.

Members of the Conference will use their influence with builders, electricity supply authorities, municipalities and others, to see that new houses are, as far as possible, provided with suitable wiring for electric clocks and that existing premises can be wired at the lowest possible rate. The Conference will also use its influence to ensure that a.c. supplies throughout the country are so controlled as regards frequency that clocks connected to them will keep exact time.

The Syrian Radio Market

British radio receivers have not hitherto enjoyed any great success in the Syrian radio market owing largely, says a recent Department of Overseas Trade report, to their not being sufficiently selective. Radio is a recent arrival in the country and the listener does not object to a little extra background noise so long as there is plenty of volume. It is suggested that United Kingdom manufacturers should get into touch with local dealers who will assist them in obtaining their share in the developing trade.

Two views of the new Berners Street showrooms of Messrs. Greene, Phillips & Co.

New Catalogues and Lists

Crompton Parkinson, Ltd., Guiseley, Yorks.—A number of blue photo-prints showing some of the manifold applications of the company's motors.

Igranic Electric Co., Ltd., 149, Queen Victoria Street, E.C.4.—Leaflet No. 1013 dealing with across-the-line type automatic motor starters with overload and phase-failure protection.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A 48-page illustrated brochure (Publication No. F.6304) on church lighting. Also leaflets Nos. A.G.6369 and P.6029 describing respectively electric sterilising chests for farms, dairies, breweries, &c., and the "Drumotor" 20-h.p. portable farm motor; a new edition of the company's wiring supplies catalogue (No. W.3); and a folder (No. 6382) suggesting various electrical appliances suitable as Christmas presents.

Electrical Equipment & Carbon Co., Ltd., 107/111, New Oxford Street, W.C.1.—List No. S.C.25 giving full details and revised prices of "Siemens-Plania" therapeutic arc lamp carbons.

Sun Electrical Co., Ltd., 118-120, Charing Cross Road, W.C.2.—A folder describing the "Sunco" electric iron and a catalogue of "Suncomains" and other electric clocks.

Watson & Sons (Electro-Medical), Ltd., 43-47, Parker Street, Kingsway, W.C.2.—A 48-page illustrated catalogue of electro-medical apparatus. Details of several new appliances are given.

Robinson & Hands Electric Co., Ltd., Barwick Street, Birmingham.—A catalogue containing 164 pages illustrating and describing the 1932-33 season's radio receivers and components.

Ericsson Telephones, Ltd., 67-73, Kingsway, W.C.2.—A leaflet describing the company's automatic telephone system for business premises, &c.

Anglo-Swiss Electrical Co., Ltd., 15, Victoria Street, S.W.1.—List No. 102 giving particulars of remote repeating and summation instruments.

Holden & Brooke, Ltd., Sirius Works, West Gorton, Manchester.—List No. 825, dealing with the "Gorton" oil cooler.

Thos. W. Ward, Ltd., Albion Works, Sheffield.—Illustrated leaflets on portable fan forges, circular saws, and electrical equipment generally.

Premier Electric Heaters, Ltd., Keeley Street and St. Andrew's Road, Birmingham.—A leaflet decribing the new "Grafton" imitation coal fire with smoke and flame effect.

Macready's Metal Co., Ltd., Baron Street, N.1.—A London stock list of "Unaspeed" bright drawn steel flats.

Holophane, Ltd., Elverton Street, Vincent Square, S.W.1.—List No. 500, the glass section of the company's general illumination catalogue.

Electro Technical Products, Ltd., 77, Fortess Road, Kentish Town, N.W.5.—A price list (No. D.1) of radio apparatus, electrical equipment, instruments and accessories.

A.C.E.C., 56, Victoria Street, S.W.1.—The November stock list of motors, generators, transformers, &c.

Bankruptcy Proceedings

F. O. Tosswill, electrical engineer, 15, Portsmouth Road, Guildford, Surrey.—The adjourned examination was conducted recently at the Guildhall, Guildford. At the previous hearing a statement of affairs was submitted which disclosed liabilities of £967, with assets of £459, and a deficiency of £508. Debtor said he held a hundred fully paid shares in a certain radio company of which he was a director. He had received no remuneration in respect of that directorship, and certain other moneys were due to him from the company. In about July last he had assigned part of the debt due to him from the company to one of his creditors, to whom he owed £48. He did not know whether the debt was eventually satisfied. The stock, which had realised about £33, had been handed over to the trustee under a deed of assignment which the debtor executed on July 15th. The hearing was further adjourned.

T. H. D. Pope, electrical engineer, 119, Commercial Road and 10, Regent Circus, Swindon.—The adjourned first meeting of creditors was held recently at Swindon. At the previous hearing it was reported that debtor attributed his failure to "loss of trade due to premises being closed during period of reconstruction after a fire, and loss of custom due to acute unemployment in the town." The Official Receiver said that debtor had applied to be allowed to wind up the estate himself. The creditors decided that a committee of inspection consisting of three of their number should be appointed to consider the suggestion. The meeting was again adjourned.

E. E. Lucas, wireless and electrical engineer, 1a, Station Road, Plymouth, Devonshire.—This debtor attended at the Western Law Courts, Guildhall, Plymouth, recently for his public examination. His statement of affairs showed liabilities of £442, and an estimated deficiency of £368. He said that he had commenced business with a capital of £40, which had been supplemented from time to time with gifts from his mother, and he had drawn £2 a week from the business which had lasted for fifteen months. The examination was closed.

Nu-Life, wet battery rejuvenators, 805-6, Salisbury House, London Wall, E.C.—The statutory first meeting of creditors was held last week at London Bankruptcy Buildings before Mr. E. Parke, Official Receiver. The debtor, Mr. L. C. Burgess, attributes his position to the failure of an advertising campaign. He owes about £900 and in the absence of substantial assets the estate was left in the hands of the Official Receiver.

R. H. Betts, radio and gramophone dealer, 488, Gorton Road, Reddish, Stockport, Lancs.—The public examination was held recently at Stockport. The liabilities amounted to £1,533, and there was a deficiency of £1,264. Debtor attributed his failure to heavy overhead charges, loss of income in 1932, interest on moneylenders' loans, heavy legal costs, and depreciation of motor vehicles. The hearing was adjourned to allow debtor to submit further accounts.

F. W. T. Mussett (trading as the Ferensway Electrical Co.), electrician, 31, Spring Bank, Hull.—The public examination was held at the Guildhall, Hull, recently, when a statement of affairs was submitted which showed a deficiency of £163. Debtor attributed his position to insufficient trade. The examination was closed.

C. T. Watson, wireless dealer, 50, High Street, Heanor.—Public examination November 15th at the Court House, 20, St. Peter's Churchyard, Derby.

G. A. Laird and **D. Hyde** (Burbury, Laird & Co.), electrical engineers, 6, Warwick Row, Coventry.—Last day for receiving proofs for dividend November 25th. Trustee, Mr. M. G. Dadley, 2, Stoneleigh Terrace, Coventry.

H. L. Wood, electrical engineer, 7, Taswell Road, Southsea.—Last day for receiving proofs for dividend November 15th. Trustee, Mr. F. H. Langmaid, 87, High Street, Portsmouth, Official Receiver.

E. Doudney, wireless wholesale and retail salesman, 93, East Street, Chichester.—First and final dividend of 6⅝d. in the £ payable November 4th at the Official Receiver's offices, 8, Old Steine, Brighton.

F. Finch, radio engineer, 2a, Fishergate Hill, Preston.—Public examination November 18th at the Sessions Hall, Lancaster Road, Preston.

V. F. Maddox, electrical and wireless engineer, 6, Homend Street, Ledbury.—Receiving order made October 28th on debtor's own petition. First meeting to-day (Friday) at the Official Receiver's office, 133, St. Owen Street, Hereford. Public examination, November 28th, at the Shirehall, Hereford.

G. F. Gilbert, electrical engineer, 60, Nottingham Road, Nottingham.—First and final dividend of 2s. 2½d. in the £, payable November 16th, at the Official Receiver's office, 22, Regent Street, Park Row, Nottingham.

Company Liquidations

Home Electric, Ltd., 24, Sackville Street, Piccadilly, W.—The accounts lodged under this compulsory liquidation show total liabilities of £5,511 (ranking £5,403) and assets of £1,214, leaving a deficiency of £4,268 with regard to contributories. The following are the principal creditors:—Brook Radio Co., Ltd., £106; Kinson Electrical Co., Ltd., £4,707; and G. Robinson & Son, Ltd., £278.

London Platino-Brazilian Telegraph Co., Ltd.—Winding up voluntarily. Liquidator, Mr. A. R. Smith, 5, London Wall, E.C.

British Ensign Engineering Co., Ltd.—Winding up voluntarily. Liquidator, Mr. H. Kidson, 45, Kingsway, W.C.

Winding-up Petition

Permec, Ltd.—A petition for the winding-up of this company has been presented to the High Court by Marconi's Wireless Telegraph Co., Ltd., and by the Gramophone Co., Ltd., and will be heard in London on November 14th.

Dissolution of Partnership

Empire Radio Electrical Engineers, wireless and electrical engineers and dealers, 132, High Street, Penge.—Messrs. L. A. Simmonds, H. J. Parker, A. L. Parker, and N. E. Parker have dissolved partnership so far as concerns Mr. Simmonds, who has retired from the firm.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, Etc.	Price Nov. 9th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19 15s.	£2 15 inc.
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac T.N. ... ... per cwt.	£3	15s. dec.
a Sulphur Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3¼d. to 3⅜d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d.	—
METALS, Etc.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ... ,,	1/2 to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£146	£2 inc.
Grade II ... ... ,,	£102	£1 inc.
Grade III ... ... ,,	£55	—
c Brass (rolled metal 2" to 12" basis)... per lb.	7½d.	—
c ,, Tubes (solid drawn) ... ... ,,	9d. to 9½d.	—
c ,, Wire, basis ... ... ,,	7⅛d.	—
c Copper Tubes (solid drawn) ... ... ,,	10d.	—
g ,, Bars (best selected) ... ... per ton	£65	—
g ,, Sheet ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£36 5s.	—
d ,, ,, Sheets ... ... ,,	£64	—
d ,, ,, Wire Rods ... ... ,,	£42	—
d ,, ,, H.C. Wire ... per lb.	6⅛d.	—
f Ebonite Rod ... ... ,,	1/3 to 1/6	—
f ,, Sheet ... ... ,,	1/3 to 1/6	—
n German Silver Wire ... ... ,,	2/2	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para fine ... ... ,,	4½d.	—
i Iron, Pig (Cleveland No. 3) ... ... per ton	58/6	—
i ,, Wire, galve. No. 1, P.O. qual. ,,	£20	—
g Lead, English pig ... ... ,,	£14	5s. inc.
g Mercury ... ... per bot.	£10 7s. to £10 15s.	15s. to 17s. 6d. inc.
e Mica (in original cases) small ... per lb.	6d. to 8/6	—
e ,, ,, medium ... ,,	4/- to 8/-	—
e ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1d.	—
p ,, ,, drawn bars & rods ,,	10½d.	¼d. dec.
p ,, ,, rolled strip & sheet ,,	10¾d.	—
p ,, ,, wire ... ... ,,	11¼d.	¼d. dec.
o Platinum ... ... per oz.	£9 10s.	—
d Silicium Bronze Wire... ... ... per lb.	7¾d.	—
r Steel, magnet, in bars... ... ... ,,	7¾d.	—
g Tin, Block (English) ... ... per ton	£156 to £158	£2 inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/1	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co. Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

Electricity Supply

Lighting, Domestic, Power

Ashford (Kent).—ELECTRICITY FOR SMARDEN.—The Urban District Council has decided to carry out an extension of the electricity supply to Smarden at an estimated cost of £4,000.

Australia.—VICTORIA.—A statement issued by the Victorian Electricity Commission shows that while there was a gross profit of £237,942 for the year 1931-32, exchange payments, provident fund, losses on the briquetting factory and the Geelong tramways, and other expenses were so heavy that the net profit was reduced to £3,031. It is pointed out, however, that the loss on the briquetting factory is more than offset by the saving to the power station, owing to the lower cost of coal. The Commissioners also state that on assuming responsibility for the Geelong tramways at the request of Parliament they stipulated that the system should not become a charge on the electricity supply business and that any losses should be borne by the Geelong electricity supply undertaking. The latter made a profit of £21,405 for the year, and the loss on the tramway would be met from this. The sale of electrical appliances by the Commission is being investigated by Colonel Harold Cohen (Honorary Minister) on behalf of the State Government and a decision is expected shortly.

Barrow-in-Furness.—SUPPLY TO CRAKE VALLEY.—The Electricity Committee is to extend mains to Crake Valley at a cost of £2,000.

Canada.—DECREASE IN ELECTRICITY EXPORTS.—The value of exports of electrical energy from Canada to the United States showed a decrease from $4,453,280 in 1930-31 to $2,710,410 in 1931-32. During September it amounted to $357,000, as compared with $487,000 in the corresponding month of last year.

ELECTRICITY FOR PAPER MAKING.—The Ontario Hydro-Electric Power Commission has entered into a contract with the Ontario Paper Co., of Thorold, Ont., to supply electricity at a low rate for a term of years, which will give the Commission a revenue of between $250,000 and $300,000 yearly.

ONTARIO ACQUIRES LARGE POWER DEVELOPMENT.—The Abitibi Canyon power development in northern Ontario is being acquired by the Ontario Hydro-Electric Power Commission, and an immediate start on the work of completing the construction is anticipated. It is expected that the proposed work will include the installation of at least two of the five turbo-generator sets for which the power house was designed. These units are to have a capacity of 66,000 h.p. each, and revised plans will probably call for a total of 132,000 h.p. in initial capacity while the eventual development from the damming of the Abitibi River will reach 330,000 h.p. Completion of the dam and power house will provide for the electrical requirements of mining and other basic industries, and for general development in a vast territory from Sudbury to James Bay. In anticipation of the delivery of power, the Commision has already completed a transmission line from Hunta to Sudbury. The line is one of the longest in Canada, being 250 miles in length.

Continental.—RUSSIA.—A conference and exhibition is to be opened in Moscow on December 1st under the auspices of the All-Union Electrical Power Industry Committee, when reports will be presented on the latest technical developments in the field of electrical communications in industry. Anyone in this country who desires to contribute papers or to participate in the exhibition should apply to Mr. A. M. Lionbovitch, Ilinka, 3/4, Teplyeriady, Nikolaevskaya, Linia, pom 46.

LATVIA.—The construction of a large hydro-electric power station costing $5,000,000 on the Daugava (Dvina) River is foreshadowed in an agreement between the Latvian Government and the American Foundation Co., just signed after seven months' negotiations. The American firm undertakes to take in hand the technical preparations at once, and two leading engineers have already arrived with a view to co-operating with the Latvian experts in the drafting of the final details. Should the Government approve the financial plan, the construction, which is estimated to take some three years, will begin next summer. The Government has retained complete freedom to place the orders for the necessary plant in whichever country it considers most advantageous.—*Reuter* (Riga).

GERMANY.—The output of the 122 principal electricity supply undertakings in Germany during June last amounted to 954,700,000 kWh, bringing the total for the first half of the current year to 6,223,900,000 kWh, as compared with 7,164,000,000 kWh in the corresponding six months of 1931.

BELGIUM.—Rapid progress is being made with the rebuilding of the Brussels central power station which was destroyed by fire on September 28th. The damage was largely confined to the turbines and the switchboard. One new turbine has already been installed and put into commission, and two more are in course of erection. One of the overhead travelling cranes has also been re-erected and a second one will be ready for use in the near future. The cost of the damage done is expected to be less than was at first anticipated. A new ferro-concrete building is being rapidly erected and provided with a light temporary roof so that the station may be ready for full operation during the coming winter.

East Dereham.—CHEAPER ELECTRICITY.—The Urban District Council has made the following reductions in the charges for electricity:—Lighting, flat-rate: From 8d. to 7d. per kWh. Domestic rate and heating of business premises: From 1½d. to 1d. per kWh. The alternative tariff of 20 per cent. of the rateable value, plus 1d. per kWh, has been made applicable to the domestic portion of business premises, and electric cookers can now be had on hire.

Epsom.—ELECTRICITY FOR WATER WORKS.—The Urban District Council has applied for sanction to a loan of £1,470 to meet the cost of giving a supply of electricity to the water undertaking.

ASSISTED WIRING.—Assisted wiring installations are to be restricted to premises (excluding business premises) over two years' old, and the electrical engineer is to submit to the Electricity Committee for consideration all applications for installations exceeding twelve points.

Federated Malay States.—BOARD'S ANNUAL REPORT.—In the annual report of the F.M.S. Electrical Board (director, Mr. W. J. Williams) it is stated that the adverse trade conditions which prevailed in 1930 became aggravated last year, but that vigorous efforts were made to offset the anticipated reduction in revenue by intensive canvassing for new consumers and by making every possible reduction in expenditure. The Government's restriction upon the production of tin had a direct adverse effect on the revenue of the Electricity Department, and, together with the strict economy exercised by all classes of consumers, caused a decline in revenue of $218,499 to $2,275,928, while expenditure was reduced by $91,703. There was a net profit of $581,947.

PENANG.—The annual report of the electricity supply undertaking for the year 1931 has been issued by the engineer, Mr. T. Rogers. The total income was $1,200,794 and the working expenses $685,902, leaving a net profit of $532,217. The electricity sold amounted to 11,458,988 kWh, as compared with 12,658,996 kWh in 1930.

Gloucester.—EXTENSIONS.—The City Council has applied for sanction to a loan of £1,100 for extending the supply of electricity in the Upton Hill district. Application has been received for a supply to fifty-two houses to be erected near the Highnam Court Estate and Lassington Lane, and the electrical engineer estimates the cost of the extensions to be £1,000.

Hastings.—EXTENSIONS.—The Electricity Committee recommends the extension of mains at the following places:—Northiam Road, Beckley, £349; Whatlington, £1,987; Winchelsea Beach, £6,334; Flackley Ash, Peasmarsh, £326; Rosemary Lane, Fairlight, £244; Rye Harbour, £3,890; and Powdermill Lane and Telham Lane, Battle, £307.

SWIMMING BATH LIGHTING.—The Improvements Committee has authorised the provision at the new West Marina bathing pool of under-water lighting similar to that at the new bathing pool at Clacton. The estimated cost of the scheme is £500.

LOAN SANCTIONED.—Sanction has been received to a loan of £20,000 for mains.

REVISED CHARGES.—The scale of electricity charges has been revised for the borough and extended areas. For general lighting in the borough the charge in excess of 4,000 kWh has been reduced from 4d. to 3d. per kWh.

India.—MYSORE'S ELECTRICAL PROGRESS.—Steady progress is maintained in the electrical equipment of the Mysore State, important works sanctioned during the past year including the eighth installation at Sivasamudram and the remodelling and deviation of power lines in Bangalore. The scheme for the electrification of rural areas for lighting and irrigation has been steadily pursued, and during the last six years some forty towns and villages have been supplied with power. The total power generated during the last year was 171 million kWh. as against 169 million kWh in the previous year. An expenditure of about Rs.14,000 was incurred in connection with the Jog (Gersoppa Falls) surveys. With a view to popularising the use of electricity for lighting, irrigation, and other purposes, a large number of concessions in regard to loans, rates, etc., were made during the year.

Irish Free State.—NENAGH.—The shareholders of the local electricity supply company have approved an offer of £5,500 by the Electricity Supply Board for the purchase of the undertaking.

THE DRUMM BATTERY.—A sum of £9,000 has been voted by Dail Eireann for development work and research in connection with the Drumm battery.

Isle of Thanet.—TWO-PART TARIFF.—The Isle of Thanet Electric Supply Co., Ltd., has adopted a two-part tariff with a charge of 1s. 3d. per quarter for each £1 of rateable value, plus 1d. per kWh consumed.

Letchworth.—SCHOOL LIGHTING.—The Herts Education Committee is to install electric lighting at the Letchworth Pixmore School premises at a cost not exceeding £165.

London.—ELECTRICITY DEPARTMENTS' REVENUES.—A clause has been inserted in a Bill drafted by the L.C.C. Parliamentary Committee under the title "London County Council (General Powers) Bill, 1933," enabling any metropolitan borough council owning an electricity undertaking to pay into the general rate fund of the borough council all receipts on the undertaking's revenue account and funds connected therewith, and to pay out of the general rate all the expenses of the undertaking on revenue account (subject to certain conditions).

OVERHEAD WIRES.—A Bill is also to be promoted in the new session of Parliament relating to the control of overhead wires in the London area.

SUPPLY COMPANY'S BALANCES.—At December 31st, 1930, there were four London electricity supply companies with balances in excess of the legal maxima. This number at December 31st, 1931, was reduced to only one, *viz.*, the South Metropolitan Company, the balance being £92,618 (maximum authorised £57,880). The company states that it is anticipated that the balance will be reduced at an early date owing to the rebate which is being granted to ordinary consumers, the special allowances to be made to industrial consumers, and to other reasons.

Lothersdale (West Riding).—RATEPAYERS APPROVE ELECTRICITY SCHEME.—The Parish Council has secured the approval of the ratepayers to a scheme offered by the Electrical Distribution of Yorkshire, Ltd., for the supply of electricity for public and private lighting, etc., together with a power supply to two large local textile mills.

Macclesfield.—THE PURCHASE OF THE ELECTRICITY UNDERTAKING.—The Town Council is not to proceed with the proposed arbitration relating to the purchase of the undertaking of the Electricity Co. of Macclesfield, Ltd. The company is to reduce the charge for power by 1d. per kWh, and that for lighting by ½d. per kWh as from the beginning of the new year, and has agreed to appoint a representative of the Corporation to the board of directors.

Maidstone.—EXTENSION SCHEMES.—The Town Council has decided to give a supply of electricity to the village of Boughton (estimated cost £2,500), to lay a new feeder to Tovil (£2,300), and to extend mains along Chatham Road and Tyland Lane (£1,535).

Ripon.—RURAL DISTRIBUTION SCHEME.—The Electricity Committee is to apply for sanction to a loan of £1,210 in connection with the distribution system in the villages of Sawley, Grantley and Calphay.

Sandbach.—ELECTRICITY FOR SEWERAGE SCHEME.—The Urban District Council has decided to utilise electricity for pumping in connection with the new sewerage scheme, and a supply is to be given by the local supply company.

Scarborough.—EXTENSIONS.—The Electricity Committee has approved the following estimates of the cost of laying interconnecting e.h.p. feeder cables between the Northstead Estate sub-station and the sub-station near the sanatorium in Cross Lane, and also in the vicinity of North Marine Road :—11,000-V cable, £1,080; switchgear, £1,445; and plant, £599.

Sheffield.—LOANS FOR MAINS SANCTIONED.—The Electricity Committee has obtained sanction to the borrowing of £100,000 for feeder mains, £2,175 for mains from Mickley Lane to Dronfield, and £19,834 for mains on the Shiregreen housing estate.

South Africa.—A CAPE TOWN POOLING AGREEMENT.—The Cape Town City Council has come to an agreement with the Electricity Supply Commission for pooling the interests of the Dock Road and Salt River power stations. The present plant at both stations will be operated jointly and the electricity sold to each party at the cost of generation. Capital redemption charges will be carried as hitherto and only extensions to plant will be debited to pool costs. The first extension will take place at Salt River station. The combined stations will be under the management of Mr. G. H. Swingler, Cape Town city electrical engineer.

Southampton.—UNEMPLOYMENT RELIEF SCHEME.—The Town Council has included in its unemployment relief plans the acceleration of the Electricity Department's scheme to improve the supply at the south end of the Avenue.

CANVASS OF HEDGE END.—The Electricity Department is canvassing the village of Hedge End with a view to extending the mains to the parish.

Stockton-on-Tees.—MAINS AND SERVICES.—The Electricity Committee is to apply for sanction to the borrowing of £10,000 for mains and services.

Stoke-on-Trent.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £340 to supply 115 houses at Longton.

Tamworth.—OFFER TO PURCHASE UNDERTAKING REJECTED.—The Town Council has decided not to entertain an offer from the Tamworth District Electric Supply Co., Ltd., to acquire the electricity undertaking.

Tring.—REVISION OF CHARGES.—The Aylesbury Town Council has issued a revised scale of charges for the district which represents a reduction of about ten per cent. all round. The new rates are :—Dwelling houses, basic area charge per 10 sq. ft., reduced from 1s. to 11d.; prepayment meter supplies, from 11d. to 10d. per kWh; maximum average price, from 10d. to 9d.; shops, business and combined premises, wattage charge, per 25 W, from 8s. to 7s. 6d.; refrigerator charges, from 2d. to 1¾d.; factory lighting, from 8d. to 7d.; power, first 500 kWh per quarter from 2¾d. to 2¼d., and from 2d. to 1¾d. beyond.

Wallasey.—BATH LIGHTING.—The Electricity Committee has arranged for a deputation to visit the new baths at Doncaster to inspect the form of lighting recently installed.

West Hartlepool.—REDUCED CHARGES.—The Electricity Committee has announced a reduction in electricity charges and a special rebate for the last quarter of the financial year.

Wigton (Cumberland).—PROSPECTS OF A SUPPLY.—The Mid-Cumberland Electricity Co., Ltd., is to commence work as soon as possible in connection with the provision of electricity for Wigton. The supply will be brought from Stainburn to Wigton and Maryport, and at present the company is actively engaged in obtaining the necessary wayleaves.

Winchester.—CHANGE-OVER SCHEME.—The City Council has decided to proceed with a change-over scheme costing approximately £75,000.

Wolverhampton.—THE UPPER PENN AREA.—The Town Council is to purchase the Upper Penn area system supply from the Midland Electric Corporation for Power Distribution, Ltd., for £40,356.

Traction

Australia.—TROLLEY-BUSES FOR PERTH.—The Western Australian Minister for Railways and Tramways (Mr. Scaddan) states that three trolley-buses are expected about Christmas, for running on the Kensington Street route, Perth. The Government has not yet decided whether to relay the track or adopt some other form of transport. Although the first three trolley-buses are being imported, the future policy will be to build the bodies locally.

MELBOURNE.—Improved conditions with regard to transport revenue in the Metropolitan area can be expected only when there is a general revival throughout industry, states the latest report of the Melbourne and Metropolitan Tramways Board. For the year ended June 30th last revenue amounted to only £1,916,071, a decrease of £144,428 as compared with 1930-31, working expenditure declining from £1,386,894 to £1,212,346; there was a net deficiency of £148,171, as against £204,628. The number of passengers carried was 161,923,072 (175,079,152 in 1930-31), of whom 122,446,035 (129,868,421) were conveyed by the electric trams.

BRISBANE.—Although there was a considerable reduction in business during the year ended June 30th last, the expenditure was reduced to such an extent that there was a net surplus of £6,036. The total revenue was £679,605 and the gross profit £199,919; owing to an alteration in the financial year no comparative figures are available. Passengers carried numbered 68,641,576, as compared with 73,616,854 in 1930. It is stated that the prospect of superseding electric trams in the Australian capital cities, particularly Brisbane, is more remote than in Great Britain. Running times are constantly being reduced and experiments are taking place which will make for greater comfort.

Continental.—SWITZERLAND.—The *E.T.Z.* reports that the newly electrified line, 36 km in length, running from Zürich through Ulster and Rapperswil und Zug-Affoltern back to Zürich, was opened recently. The transmission lines have double insulation to protect them against disturbances from birds. The cost of the electrification was 4,374,000 Rm without locomotives.

The lights of New York seen from seventy floors above Fifth Avenue. The Empire State Building—the tallest building in the world—is a prominent feature

BELGIUM.—The introduction of electric traction on the Belgian local railways continues to increase. Various new lines have recently been opened to traffic and others are in process of being equipped. At the beginning of this month the electrified lines covered a length of 682 miles.

Federated Malay States.—PENANG.—The general manager of the tramway and trolley-bus undertaking, Mr. T. Rogers, has sent us his report for the year 1931. The total number of passengers carried was 9,103,212, of which the trams accounted for 4,010,224, while the total receipts were $264,320 (trams, $145,781). The working expenses totalled $233,412, and there was a net loss of $3,101.

Japan.—UNDERGROUND RAILWAY FOR TOKYO.—The Tokyo Underground Railway Co. has been successful in arranging a loan of 5,000,000 yen for its underground railway scheme and is expected to start work soon on the construction of a line between Kyobashi and Shimbashi.

Manchester.—TROLLEY-BUSES.—By the Manchester Corporation Bill, 1933, the City Council is seeking powers to run trolley-buses along certain streets inside and outside the city, including a number of streets and roads in Stretford.

Middlesbrough.—THE FUTURE OF THE TRAMWAYS.—The Town Council proposes to promote a Bill in the next session of Parliament providing among other things for the substitution of trolley-buses for tramcars. Mr. J. Wesley Brown, chairman of the Finance Committee, states that nothing definite has been settled regarding the transport system and that the Bill is purely a precaution.

Plymouth.—TRAMWAY RECONSTRUCTION.—The Corporation is to reconstruct the tramway in Drake Circus at a cost of £1,200.

Scarborough.—ELECTRIC SIGNALLING.—The Corporation is asking the borough engineer to submit an estimate of the cost of installing an electric signalling system on the North Bay Railway.

Southern Railway.—CORRECTION.—The London Power Co., Ltd., informs us that the stoppage which occurred on the Eastern Section of the Southern Railway on November 1st was caused by the tripping due to overload of the feeders at the Lewisham sub-station of the Southern Railway Co., and not at the Deptford power station as stated in our last issue.

SHORT-CIRCUIT DISORGANISES BRIGHTON LINE.—Last Friday evening a short-circuit, caused by a workman dropping a drilling machine on to a live wire just outside Brighton Central station, put the signalling apparatus out of order and disorganised traffic for over six hours.

York.—TRANSFER OF TRANSPORT UNDERTAKING.—The City Council is to consider at an early date a report by a sub-committee on the negotiations which have been proceeding with the West Yorkshire Road Car Co. regarding the transfer of the Corporation's transport undertaking to the company. When the transfer takes place the Corporation's tramway service will be gradually replaced by buses, and it is understood that the Daringhouse tram route will be scrapped immediately. It is proposed to run the service under a joint authority representing both the Corporation and the Road Car Co.

Communications

Belgian Congo.—TELEPHONE SERVICE TO GREAT BRITAIN.—A telephone service has now been inaugurated between Great Britain and Leopoldville, the charge for a three-minute call from London being £2 17s.

Belgium.—RELAY RADIO EXCHANGES.—A relay wireless service is being established in Ghent under the control of the city authorities. Equipment with a capacity for 20,000 subscribers is to be installed, immediate applications being expected to number 3,500. Subscribers will purchase their own loud-speakers and will have available at all times a choice of four programmes.

Birmingham.—AUTOMATIC TELEPHONE PROGRESS.—Three new automatic telephone exchanges, to be known as Broadwell, Blackheath and Castle Bromwich, forming part of the Birmingham automatic telephone network, were brought into service last month. They have been manufactured and installed by Messrs. Siemens Bros. & Co., Ltd., who have already supplied three exchanges in this area and have another six in course of construction.

Denmark.—SUCCESSFUL B.B.C. TELEVISION BROADCAST.—A successful television transmission from the British Broadcasting Corporation in England to Denmark has been received at Copenhagen, states the *Daily Telegraph*. In the presence of a number of technical experts a television broadcast from England was picked up by the Vestfronten wireless station. It was re-transmitted by land lines to Copenhagen, where it was projected on to a screen about 3 ft. by 7 ft. The pictures and voices were transmitted separately, and were then perfectly synchronised before projection. Both the voices and the pictures were remarkably clear, even the details of the faces being easily seen.

Empire Broadcasting.—B.B.C.'s PLANS.—Plans for the Empire broadcasting service which will commence from the B.B.C.'s new Daventry station on December 19th, were made known on Monday. It is proposed to broadcast programmes of two hours' duration intended for the following five zones: Australia, New Zealand and the Pacific Islands (9.30 to 11.30 a.m.); India, Burma, Ceylon, and the Malay States (2.30 to 4.30 p.m.); East Africa, Mauritius, Egypt, Malta, and Palestine (6 to 8 p.m.); West Africa, Falkland Islands, and perhaps South America (8.30 to 10.30 p.m.); and Canada, West Indies, Honduras, etc. (1 to 3 a.m.).

Germany.—LICENCES.—At October 1st the number of broadcast receiving licences in force was 4,077,347, of which 481,627 were exempt from payment, the corresponding figures at July 1st being 4,119,531 and 412,177 respectively.

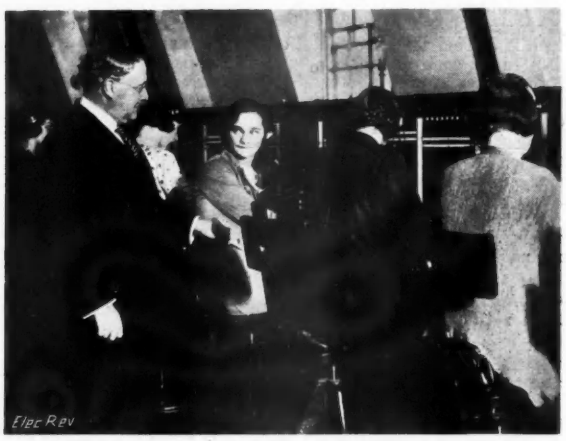
Great Britain.—WIRELESS TELEPHONY FOR SHIPPING.—The work of equipping eight additional coastal wireless stations with wireless telephone installation, has now been completed by the Marconi International Marine Communication Co., Ltd., and eleven of these stations are in operation and available to shipping. Beginning with Wick in the North of Scotland, these stations extend down the East coast where there are Cullercoats, the Humber, and North Foreland. Then comes Niton in the Isle of Wight, and Land's End, with Fishguard, Seaforth and Port Patrick on the West coast, Malin Head in Northern Ireland, and Valentia in the Irish Free State. There is now, therefore, a complete chain of low power radio-telephone stations round the coasts by means of which all ships within two or three hundred miles of the British coasts can, if suitably equipped, communicate by telephony with one or other of these stations.

India.—IMPROVED SERVICES.—Imperial and International Communications, Ltd., announce that arrangements have been made with the Indian Government whereby Calcutta is connected by direct line to the offices of the Indian Radio and Cable Communications Co. in Bombay. The teleprinter system will be worked on this section. This should lead to increased accuracy and considerable speeding up of the service.

Italy.—A PRIVATE SHORT-WAVE STATION FOR THE POPE.—According to the *Daily Telegraph*, the Marconi Co., is installing a permanent ultra-short wave radio receiving and transmitting equipment for use between the Vatican wireless station and the Papal summer residence at Castelgandolfo, twelve miles from Rome. A special relay will connect this with the telephone in the Pope's private library. This is the first regular private installation of its kind, the wave-length used being half a metre.

London.—THE TELEPHONE SERVICE.—London, with 780,000 telephone subscribers, has the fewest telephones of any of the great cities of the world, according to figures published in Berlin. A list of large cities shows the number of telephones per 100 inhabitants to be as follows:—San Francisco, 40.2; Stockholm, 31.2; Paris, 13.1; Berlin, 12.2; and London, 9.6. Berlin's subscribers are dwindling, and within the last year 40,000 residents have given up their telephones.—*Reuter* (Berlin).

LARGEST AUTOMATIC EXCHANGE OPENED.—What is stated to be the largest automatic exchange in Europe was opened in Farm Street, Mayfair, on Tuesday, by Sir Kingsley Wood,



Sir Kingsley Wood chatting to operators after performing the opening ceremony at the new Farm Street Exchange, Mayfair

the Postmaster-General. Eventually the new exchange will incorporate the Regent, Langham, Grosvenor and Mayfair exchanges, and next January there will be 13,000 lines in operation, this number being increased ultimately to 30,000.

Spain.—THE CABLE AND WIRELESS CONVENTION.—An effort is to be made to end the Radio-Telegraphic Conference on or about November 15th, when it is confidently expected in official circles that all the countries of the world, including Russia, will sign the single convention, embodying both the wireless and telegraphic agreements. The suggested distribution of frequency bands is being dealt with. A scheme for the distribution of lower waves has received general approval, but the long-wave problem is proving itself one of the most difficult to settle. The use of spark waves by sea and air traffic, and the limitation of station power to remedy interferences have been examined. The Telephone Commission has finished its work, confirming existing practice, and the work of the Telegraphic Commission is proceeding satisfactorily.—*Reuter* (Madrid).

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—January 10th. Post and Telegraph Department. Telephone jacks and number plates (A.X. 11580)* and loading coil pots (A.X. 11578).*

January 17th. Switchboard keys and parts (A.X. 11582)* and telephone bells and parts (A.X. 11583)*.

GRAFTON.—December 19th. Clarence River County Council. 1,000-kVA turbo-alternator set for Nymboida power station. (A.X. 11561.)*

Barwick-in-Elmet.—November 14th. West Riding Education Committee. Electric lighting installation in school. Education officer, County Hall, Wakefield.

Belper (Derby).—November 14th. County Public Assistance Committee. Electric lighting installation at the Poor Law Institution. County architect, Derby.

Blackburn.—November 16th. Town Council. Automatic traffic control signals at (*a*) Preston New Road and Revidge Road; (*b*) Darwen Street and Jubilee Street; (*c*) Darwen Street Bridge. Borough engineer, Town Hall.

Bridgwater.—November 28th. Corporation. Pumping machinery. Mr. E. A. Sandford Fawcett, 53, Victoria Street, S.W.1. (Deposit £5 5s.).

Egypt.—CAIRO.—December 17th. Ministry of the Interior. Overhead and underground distribution network for the town of Fikria. (A.X. 11552.)*

December 20th. Power station and overhead distribution network for the town of Fagus. (A.X. 11550.)*

Glasgow.—November 12th. Public Assistance Department. Stores, including electrical fittings, for various institutions. Contracts Department, 265, George Street, Glasgow.

India.—NEW DELHI.—November 17th. Flame-proof v.i.r. cables. (A.X. 11560.)*

Irish Free State.—DUBLIN.—November 16th. Corporation. Four electrically driven hydro-extractors; and the installation of electric motors and wiring at Iveagh Market. City treasurer, Exchange Buildings, Lord Edward Street (specification, 5s. each section).

London.—FULHAM.—November 18th. Borough Council. One 120-ton and one 15-ton overhead electric travelling cranes. Messrs. Preece, Cardew & Rider, 8, Queen Anne's Gate, S.W.1 (deposit £5).

Newcastle-upon-Tyne.—November 23rd. Corporation. One 30-ton and one 5-ton electric travelling gantry cranes. City engineer, Town Hall.

South Africa.—JOHANNESBURG.—December 19th. South African Railways and Harbours. Manual telephone exchange for Durban. (A.X. 11558.)*

Swansea.—November 14th. Electricity Department. Structural steelwork for Tir John North power station. Messrs. Preece, Cardew & Rider, 8, Queen Anne's Gate, S.W.1 (deposit £5 5s.

Wadsley (near Sheffield).—November 17th. West Riding Mental Hospitals Board. Wiring for electric lighting installation in females' dining hall at the Wadsley Mental Hospital. Mr. E. H. Burton, architect to Board, Wakefield (deposit £1).

Walsall.—November 24th. Electric Supply Department. E.h.p. and l.p. cable. (See this issue.)

West Midlands.—December 9th. Joint Electricity Authority. Static step-down transforming plant for the Ocker Hill generating station. (See this issue.)

Whitehaven.—Electric Supply Department. E.h.p. overhead line. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Chesterfield.—Watch Committee. Recommended. "Electromatic" traffic signals (£1,705).—Automatic Electric Co., Ltd.

Dewsbury.—Town Council. Accepted. Wiring the public baths for electric lighting (£141).—Brown & Senior.

Fife.—Education Committee. Accepted. Rotary convertor for Kirkcaldy Technical School (£102).—Oliver Melville & Co.

Gillingham.—Electricity Committee. Accepted. Switchgear alterations (£472).—A. Reyrolle & Co., Ltd.

London.—L.C.C. Central Public Health Committee. Accepted. Bed lift at Bethnal Green Hospital (£786).—Evans Lifts, Ltd. Rewiring four wards for electric lighting at Colindale Hospital (£404).—J. Briggs (Electrical Contractors), Ltd. Rewiring for electric lighting in one ward at the Eastern Hospital (£537).—Electrical Installations, Ltd. Telephone equipment, Highgate Hospital (£330).—Reliance Telephone Co., Ltd. Extension of external wiring, Highgate Hospital (£53).—Pinchin & Walton. Electric lift, St. Charles Hospital (£767).—Waygood-Otis, Ltd. Wiring and fittings for electric lighting in nurses' home and ward, St. Luke's Hospital (£638).—Electrical Installations, Ltd. Stretcher lift and service lift, Hackney Hospital (£773).—Etchells, Congdon & Muir, Ltd.

Sleaford.—U.D.C. Electricity Committee. Accepted. Meters (£429).—Aron Electricity Meter, Ltd. Wiring at electricity works (74).—J. Baxter.

Stretford.—Town Hall Committee. Accepted. Lightning conductors for new municipal buildings (£74).—J. Faulkner and Sons. Electric clocks (£462).—Synchronome Co., Ltd.

Surbiton.—Metropolitan Water Board. Recommended. Electrically driven and water turbine driven vertical centrifugal well pumps, and one 50-kW water driven generator, piping, &c., at the Surbiton pumping station (£11,555).—Worthington-Simpson, Ltd.

Forthcoming Events

Junior Institution of Engineers.—Friday, November 11th. Institution, London. 7.30 p.m. Annual general meeting.

British Electrical Development Association (Northern Counties Area).—Wednesday, November 16th. Sopwith's Lounge, Newcastle-upon-Tyne. 7.15 p.m. "Advertising and the Salesman." Mr. J. Newcomb.

Edinburgh Electrical Society.—Wednesday, November 16th. Philosophical Institution, Edinburgh. 8 p.m. "The Construction and Various Uses of Accumulators." Mr. C. P. Lockton.

Diesel Engine Users' Association.—Wednesday, November 16th. Caxton Hall, Westminster, S.W. 3 p.m. "Rated Output of Diesel Engines." Mr. W. A. Tookey.

Electrical Association for Women.—Thursday, November 17th. Lighting Service Bureau, Savoy Street, W.C. 3 p.m. "Decorating the Home with Light." Miss D. Noakes.

Institution of Electrical Engineers.—Thursday, November 17th. Institution, London. 6 p.m. "The Inland Telegraph Service—The Introduction of Modern Machinery and Methods." Mr. R. P. Smith. (*London Students' Section*).—Friday, November 11th. Institution, London. 6.15 p.m. "Some of the Less Well-known Methods of Electric Propulsion." R. J. Eldred. Saturday, November 12th. 3 p.m. Visit to the Home Office Industrial Museum, Horseferry Road, S.W. (*Western Centre*).—Monday, November 14th. Merchant Venturers' Technical College, Bristol. 6 p.m. "Luminous Tube Lighting." Mr. C. C. Paterson. (*North-Eastern Centre*).—Monday, November

The electrically lighted garden of the "Ace of Spades" is a bright spot on the Kingston By-pass Road

14th. Armstrong College, Newcastle-upon-Tyne. 7 p.m. "The Electric Lighting of Buildings." Messrs. A. B. Read and J. W. T. Walsh. (*North-Western Centre*).—Tuesday, November 15th. Engineers' Club, Manchester. 7 p.m. "Luminous Tube Lighting." Mr. C. C. Paterson. (*East Midland Sub-Centre*).—Tuesday, November 15th. The College, Loughborough. 6.45 p.m. Address by Mr. J. Morton, chairman of the South Midland Centre. (*Sheffield Sub-Centre*).—Wednesday, November 16th. Royal Victoria Hotel, Sheffield. 7.30 p.m. "The Steel-Melting Coreless Induction Furnace." Mr. M. J. Marchbanks. (*Irish Centre*).—Thursday, November 17th. Trinity College, Dublin. 7.45 p.m. Chairman's address. Mr. F. R. Unwin. (*North-Western Students' Section*).—Saturday, November 19th. College of Technology, Manchester. 7 p.m. Annual dance. (*North-Eastern Students' Section*).—Friday, November 18th. Tilleys' Grand Assembly Rooms, Newcastle-upon-Tyne. 8 p.m. Annual dance.

Electrical Trades Benevolent Institution.—Friday, November 18th. Grosvenor House, Park Lane, W. 8.30 p.m. Electrical Industry Ball.

Overhead Lines Association. — Friday, November 18th. Georgian Restaurant, Harrods, Knightsbridge, W. 8 p.m. Annual conversazione.

Association of Supervising Electrical Engineers.—Tuesday, November 15th. Junior Institution of Engineers, London. 7.15 p.m. "Electrical Equipment of a Large Modern Store." Mr. D. Winton Thorpe.

Institution of Civil Engineers (Yorkshire Section).—Thursday, November 17th. Hotel Metropole, Leeds. 7.30 p.m. Joint meeting with the local Centre of the I.E.E. "Main Road Public Lighting." Mr. C. Cameron Kirby.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of the makers of the following:—

ARDENT electric bed warmer.
M. AND N. reflector.
S.E.M. PARIS water or milk heating appliances (British agents).
METRAM lamps.
EZI electric iron.
NON-PARRELL switch fuses.
ACE switch and fuse gear.
M.L.W. lampholder.

Notes

The New Belfast Houses of Parliament

The new Houses of Parliament at Stormont, near Belfast, which are to be opened by H.R.H. the Prince of Wales on November 16th, have a very extensive electrical installation. Of the ninety miles of cables installed some are of exceptional size, the largest used on the contract being a four-core paper-insulated, lead-covered and armoured cable, having three cores of 0.5 sq. in. and one of 0.25 sq. in. About 133,000 ft. of steel conduit has been used.

The contract, which was carried out by Messrs. T. Clarke & Co., Ltd., London, included the supply and erection of all main switchboards and control gear and the complete cable and wiring installation for power, lighting, telephones, bells, clocks, electrical annunciators, etc. Outside the building there are approximately 4½ miles of processional roads, all of which are lighted by special standards, and the whole of the underground cabling for this special lighting was also laid by the contractors. Operations were commenced on the site on May 30th, 1929, and completed on October 1st last. The lighting in the Senate and Commons Rooms is particularly noteworthy, being of the roof panel type and giving a very fine diffused effect, equivalent to daylight, through the special parchment-finish glass used for the panels. The central electrolier in the main entrance hall came from Windsor Castle, and was presented by H.M. the King. This weighs approximately 1½ tons, and was also installed and wired by Messrs. Clarke. The whole of the cables used throughout the building and grounds were manufactured and supplied by Johnson & Phillips, Ltd.

Illustrations of the new buildings appear on page 701.

The I.E.E. (Meter and Instrument Section)

The annual dinner and reunion of the Meter and Instrument Section of the Institution of Electrical Engineers will be held at the Florence Restaurant, 56, Rupert Street, W., on December 3rd, when the chief guest will be the president of the Institution, Prof. E. W. Marchant. Tickets (7s. 6d. each, exclusive of wines) can be obtained from Mr. P. F. Rowell, secretary of the Institution.

An E.T.B.I. Dance at Birmingham

The annual dance of the Birmingham Branch Centre of the Electrical Trades Benevolent Institution was held at the Magnet (G.E.C.) Club, Birmingham, on November 4th. A large number of representatives of the electrical industry in the Midlands were present, and Capt. Keeping, the Secretary of the Institution, also attended. During the evening, the chairman of the branch, Mr. F. W. Martin, briefly outlined the objects of the movement. Many innovations were introduced during the evening in the nature of side shows, competitions, &c., which added considerably to the entertainment of those present, and helped to swell the Institution's funds. A photograph taken during the evening is reproduced on page 727.

Electrical men in the district are invited to forward subscriptions either to the hon. secretary, Mr. R. M. Verity, Plume Works, Aston, or the hon. treasurer, Mr. H. N. Whitford, G.E.C. Engineering Works, Witton.

The E.T.B.I. Ball

Mr. R. P. Sloan, the president, writes to remind those who have not yet obtained tickets for the Ball, to be held in London on November 18th, in aid of the Institution's funds, that early application will greatly facilitate the making of arrangements. He asks us to state that subscriptions towards the funds, whether large or small, will be greatly appreciated.

The R.N.D. Signal Company's Dinner

The fourteenth annual dinner of the R.N.D. Signal Company will be held at the Coventry Restaurant, 7, Rupert Street, Piccadilly, on November 19th. Further particulars may be obtained from the hon. sec., Mr. T. N. Riley, St. Vincent, The Avenue, Radlett, Herts.

Fatality

An inquest was held on November 8th at Drinkstone, near Stowmarket, on Matthew Andrew Gibson (aged fifteen), who received a fatal electric shock at 19,000 V. Evidence was given that the lad climbed up a "pylon" and came into contact with the cable. A formal verdict was returned.

Appointments Vacant

Assistant engineer for Oxford Electricity Department.
Switchboard attendants for the Mersey Power Co., Ltd.
Engineer and secretary for the Isle of Man Electricity Board.
(See our advertisement pages to-day.)

The E.A.W.

Lady Mount Temple presided over a well-attended meeting of the Electrical Association for Women on November 2nd at the E.L.M.A. Lighting Service Bureau. Members were very appreciative of the useful hints with regard to home lighting given by Miss D. Noakes in the course of her lecture on "The Charm of the Well-lighted Home." They also had an opportunity of seeing the new demonstrations in the bureau in connection with home lighting.

Last Saturday a representative gathering of E.A.W. members attended a lecture and demonstration on British standard outlets, standardised accessories, the use of "Bakelite," and various forms of adaptors and cooker control units at the London showroom of Messrs. J. H. Tucker & Co., Ltd., at 22/23, D'Arblay Street, W.1. The lecture was arranged and given by Mr. J. B. Tucker, managing director of the company.

I.E.E. Summer Meeting, 1933

The Council of the Institution of Electrical Engineers has accepted an invitation from the committee of the Western Local Centre to hold the next Summer Meeting in that district. Full particulars will be circulated to members in due course.

Garage Electrical Equipment

The Glasgow Corporation's new bus garage at Knightswood, erected at a cost of £75,000, was opened recently by Lord Provost Sir Thomas Kelly. The heating installation of both garages and offices, which has been carried out by Messrs. James Combe & Son, Ltd., Glasgow, is all-electric throughout, with thermostatic control. The heat is passed from electrode boilers into large storage cylinders during off-peak hours, and is stored in these cylinders for use when required. For the garage two electrode boilers of 1,000-kW capacity (6,600 V) are used. The heat, after being stored in four large cylinders of 3,500 gallons capacity each, is pumped into a main heating and several subsidiary batteries in the ducts. Fans are used for circulating air over the batteries into the garage, the air being then recirculated and reheated, except when buses are being taken in or out, when a separate exhaust system is put into operation to extract the fumes from the vehicles. For the offices a separate electrode boiler and storage cylinder is used, the boiler in this case being of the low-voltage type of 250-kW capacity. The heating apparatus in the offices is a direct low-pressure hot water installation with accelerated circulation. A. Reyrolle & Co., Newcastle, made the electrode boilers for the installation. The bus washing shed is equipped with four B.E.N.-Myers electrically driven pumps. In the petrol filling shed there are four Bowser electrically driven pumps.

Novel Overhead-line Construction

The Tiroler Wasserkraftwerke A.G. operates an eight-mile overhead line between the Wilten sub-station in a suburb of Innsbruck and the town of Hall, Tyrol. Most of this line consists of three stranded copper conductors of 0.039 sq. in. section carried by pin insulators on wooden posts, but a special construction had to be used to traverse a built-up district in the south of Innsbruck. The route there followed is that of the River Sill; where the line cannot be accommodated on either bank, owing to the presence of buildings or ornamental trees, it is carried over the centre of the stream for a distance of 0.62 mile by steel ropes attached to lattice masts on each bank. This construction, which is substantially similar to that of a tramway trolley wire carried by cross wires, has proved satisfactory in service and, according to the *Zeitschrift des Vereines deutscher Ingenieure*, it is cheaper than a 25-kV underground cable.

The steel cross-ropes are of 0.147 sq. in. section, attached to the tops of lattice steel masts 31 to 41 ft. in height opposite to each other on the banks, the span being about 100 ft. The standard copper conductors, of 0.077 sq. in. cross section, are in the same horizontal plane. The outside phases are insulated from earth by a double-cap porcelain insulator 11 in. in height with two 11-in. petticoats. Similar, but slightly smaller, insulators are used between the outer conductors and the middle conductor. Double suspensions are used where the line crosses bridges, except in the case of one high bridge. In this instance the line passes underneath, being carried by cross-ropes attached to the bridge abutments.

A Floating Diesel Power Station

For general service in connection with constructional work and maintenance operations on inland waterways, the Märkischen Wasserstrassen authority uses a floating power plant, which eliminates the trouble and expense of erecting temporary plant on land where no permanent supply is available. According to an article by Hans Koch in the *Elektrotechnische Zeitschrift*, a barge-like vessel about 82¾ ft. in length and 17 ft. wide, drawing only 3¼ ft. of water, is provided with an engine room amidships and with store rooms, a workshop, and living quarters fore and aft.

Three four-cylinder, four-stroke 150-h.p. 350-r.p.m. Diesel engines are direct coupled to 125-kW, 50-cycle, three-phase alternators and exciters. Normally, the engines are started by compressed air derived from an electrically driven compressor supplied by the main generators or from an 8-h.p. auxiliary generator driven by a small hand-started Diesel motor. This auxiliary set serves also for lighting supply when the main plant is shut down. Hot water is provided for the whole power house and for warming up the engines. The fuel tank holds about 1,650 gal. of oil, and an oil filter is installed.

The switchboard supplies four circuits from the deck, besides two service circuits on board. The service circuits can be changed over to the auxiliary generator if desired. In the course of two years' work at the Grosswusterwitz locks this floating plant produced about 1,200,000 kWh.

An Address Wanted

Will Mr. A. Cadman, who recently communicated with us, kindly let us have his address.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. B. H. Binder, of Messrs. Binder, Hamlyn & Co., has been elected a director of the India Rubber, Gutta Percha & Telegraph Works Co., Ltd., and succeeds the late Sir John Ferguson as chairman. Mr. Binder has wide interests and is a director of a number of companies, including the Ford Paper Mills, Ltd., the Inveresk Paper Co., Ltd., Buenos Aires Town and Docks Tramways, Ltd., being chairman of the last two and several other South American companies.

[*Sport & General*

Mr. B. H. Binder, the new chairman of the Silvertown Company

The following interesting announcement from *The Times* will recall to readers' minds the fact that **Mr. Siddeley** is representing B.E.A.M.A. concerns at Buenos Aires:—"An engagement is announced between Mr. Clive Brook, of Buenos Aires, only son of Mr. and Mrs. A. Victor Brook, of London, and Blanche Margaret (Meg), only daughter of Mr. and Mrs. H. C. Siddeley, late of Warlingham, Surrey, and of Calle Uruguay 888, Buenos Aires.

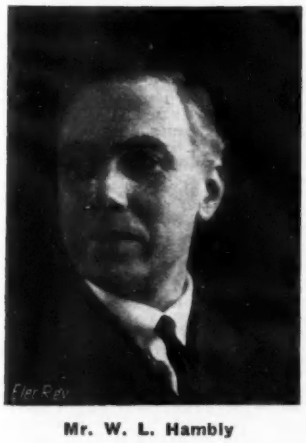
Mr. E. W. Jones, electrical engineer to the Mountain Ash (Glam.), Urban District Council, has been presented with an illuminated address as a mark of appreciation of his work in connection with the electricity undertaking.

Mr. H. G. Sharp, M.I.E.E., chief designer of the Lancashire Dynamo & Crypto, Ltd. (Willesden Works), is leaving this company at the end of this year owing to the transfer of the production of larger machines down to 5 h.p. to the company's Manchester works. We understand that Mr. Sharp, who has been with the company for 28½ years, has been responsible for various inventions relating to self-starting motors, commutating rectifiers, variable frequency alternators and other electrical apparatus. Mr. Sharp, who has not yet made any future arrangements asks us to state that communications for him should be addressed to 85, Harrow View, Harrow, Middlesex.

[*Elliott and Fry.*

Mr. H. G. Sharp

"Beeantee" Iluminations, Ltd., state that **Mr. W. T. Wildman,** their manager, has relinquished his connection with the company.



Mr. W. L. Hambly

Mr. W. L. Hambly has joined British National Electrics, Ltd., and has been appointed sales engineer in connection with the company's London office, which is shortly to be opened. Mr. Hambly is well known from his long connection with the British Electric Transformer Co., Ltd. His temporary address is 28, Victoria Street, S.W.

Mr. G. Somerville, borough electrical engineer of Faversham, has been paid 100 guineas by the Town Council as remuneration for services in preparing schemes, estimates, specifications, &c., in connection with the bulk supply, and as consulting engineer in connection with the installation of plant, &c., at the electricity works.

Mr. W. J. C. Hall, of the staff of Marchant & Co., electrical contractors, of 81, Sandgate Road, Folkestone, who was recently married, has been presented by his colleagues with a canteen of cutlery.

Mr. R. Tilt Goymer was married on October 29th at Menai Bridge to Miss Evelyn Prothero, daughter of Mr. R. H. Prothero, chief constable of Anglesey. Mr. Goymer is employed as engineer in charge of a contract in the Northampton area for the J. L. Eve Construction Co., Ltd.

Mr. H. H. Spencer, this year's president of the Association of Mining Electrical Engineers, is now recuperating from his recent illness, and was to deliver his address last evening at a meeting of the Association held at the Junior Institution of Engineers. Mr. Spencer served his apprenticeship with Crompton's and has remained with the company ever since, his service being broken only by the War period, during which he was with the Royal Engineers. After the War he was the company's representative in Glasgow, where he had a good deal to do with the supply of plant for Scottish mines. Upon leaving Glasgow he came to London, where he is now managing the plant section of the London sales.

Mr. H. H. Spencer, president of the A.M.E.E.

Mr. R. Vine Hall, assistant chief engineer of the Sydney Municipal Electrical Department, has, according to the *Electrical Engineer and Merchandiser*, been elected chairman of the N.S.W. section of the Institution of Electrical Engineers.

Obituary

Mr. J. P. Kemp.—We regret to learn of the sudden death in London on November 6th of Mr. James Pattison Kemp, formerly resident engineer at the Dickinson Street and Stuart Street stations of the Manchester Corporation and of the Summer Lane station of the Birmingham Corporation. Later Mr. Kemp was in the service of Messrs. J. G. White & Co., and supervised the erection of tramway stations for them at Para and Pernambuco. On his return to England he became Birmingham district agent for Edison Accumulators, Ltd. Just prior to his death he was engaged on the equipment of cinemas with talking and music reproducing apparatus. Mr. Kemp was one of the pioneers in the use of CO_2 recorders, water meters and calorimeters in large central stations.

Mr. N. Murray.—Mr. Noel Murray, A.M.I.E.E. (London), a well-known Melbourne electrical engineer, has died there at the age of 59. He was a son of the late Mr. K. L. Murray, M.I.E.E., a former Commissioner of the Victorian Railways. He began his engineering career with the New Australian Electric Co., in Melbourne, which installed the first electric light and power plant in Australia. Later he was associated with Siemens Bros. & Co., and assisted in the installation of the electric tramways at Bendigo and Hobart—the first in the Commonwealth—and afterwards was chief engineer of the Hobart tramways. In 1901 he became a consulting engineer and at the time of his death was managing director of Newton Automatic Sprinklers Pty., Ltd., and Noel Murray & Son Pty., Ltd.

Mr. W. S. Rawson.—The death occurred suddenly on November 4th, at Yew Tree Cottage, Whitchurch, Oxon, of Mr. William Stepney Rawson, third son of the late Sir W. Rawson, K.C.M.G.

Herr A. Lederer.—The death recently occurred in Vienna, at the age of 62 years, of Herr Anton Lederer, a pioneer worker in metal-filament electric lamps and a leading Austrian authority on electrical illumination.

Ald. J. Berry Thornley.—The death of Ald. John Berry Thornley, J.P., occurred on October 30th last, at Darwen, after a short illness. He had been chairman of the Darwen Corporation Electricity Committee for twenty-two years.

Mr. L. Johnson.—The death is announced of Mr. Loyzeleur Johnson, of Leytonstone, E., who was Continental representative of the Pulsometer Engineering Co., Ltd.

Radio Research Publications

Conclusions of considerable importance, reached as the result of a theoretical and experimental investigation of high selectivity tone-corrected radio receiving circuits, are contained in Special Report No. 12 of the Radio Research Board of the Department of Scientific and Industrial Research (H.M. Stationery Office, price 1s. 3d. net).

The World's Electrical Exports

HOW great was the upward movement in the German electrical manufacturing industry and the supply industry is shown by the fact that while at the end of September, 1909, there were thirty-nine manufacturing companies with a total share capital of 189 million marks, at the close of 1930 there were 218 with a total share capital of 895 million marks. At the same time the number of supply companies increased from ninety to 201 and the share capital from 594 million marks to 2,101 million marks.

As to the German exports of electrical manufactures it is shown by the Siemens concern in its recent "Special Archives of German Industry" that the value reached a maximum in 1929 with a total value of 639 million marks; it decreased to 630 million marks in 1930 and then fell to 538 million marks in 1931. The aggregate turnover of the electrical industry, however, shrank to a much greater extent as the fall in the inland market was very severe.

Mr. F. W. Martin (Chairman of the Midland Section of the Electrical Trades Benevolent Institution) greeting Mr. Whitford (G.E.C.) at the annual dance of the Midland Section, reference to which is made on p. 726 of this issue

The eight principal exporting countries, which are responsible for over 90 per cent. of the world trade in electrical manufactures, had combined exports of electrical machinery and apparatus valued at 2,128 million marks in 1929, 2,010 millions in 1930, but only 1,497 millions in 1931. The United States, Great Britain, and Holland experienced a reduction which exceeded the average decline, while other countries, although suffering considerable decreases in absolute values, were yet able to increase their proportional share. In general, the European markets proved to be more resistant than those of the large overseas countries which are still capable of development.

All the more threatening, therefore, it is said, is the increasing competition of the electrical industry in wealthy countries, in particular that of the United States in the European markets, as with their great capital strength the Americans are able to secure a hold by participating in German firms and in German business in a very serious manner. According to American statistics, the value of United States electrical exports to Europe, which amounted only to about $30 million in 1929, rose to $32.26 million in 1930 and to $32.32 million in 1931. On the other hand, the *total* electrical exports from the United States declined from $150 million in 1929 to $93 million.

As is stated above, the aggregate exports of the eight principal countries fell from 2,010 million marks in 1930 to 1,497 million marks in 1931. Germany's share of the trade increased from 31.3 per cent. in 1930 to 35.9 per cent. in 1931; that of France rose from 4.3 per cent. to 5 per cent. in that period; Switzerland's from 3.7 per cent. to 3.8 per cent.; and Austria's from 2.5 per cent. to 2.6 per cent. On the other hand, the proportion taken by Great Britain is stated to have fallen from 18.7 per cent. to 15.2 per cent., that of the United States from 26.6 per cent. to 25.5 per cent., and that of Holland from 8.9 per cent. to 8.1 per cent. Sweden's share remained at about the same level—3.9 per cent.

The Probable Future

It is considered impossible to draw any conclusion as to the future prospects, but the figures for the current year are lower than those for 1931. Thus the value of German electrical exports amounted to 215.99 million marks in the period from January to May, 1931, whereas in the corresponding period of 1932 the value fell to 160.69 million marks. In a similar manner electrical exports from the United States decreased from $23.10 million in the first quarter of 1931 to $13.81 million in the corresponding period of this year.

Concerning the possibilities of the future development of the electrical industry, it is thought that although it may quite safely be assumed that over 80 per cent. of the industrial motive power in Germany and the United States is electrical, industries which are still in the early stages of development, still offer extraordinarily great possibilities for the further utilisation of electrical energy. Examples quoted are the refining of metals, especially the production of electrolytic copper, the smelting of iron and steel and other metals, the annealing and hardening of metals, porcelain firing, &c. Among other directions in which progress may be expected are agriculture, transport, home industries, domestic lighting and heating, telephony, &c.

In all these directions the hope is expressed that German industry will be able to offer sufficient technical and financial resistance to the present economic crisis so as to be able to take a leading part when better times return.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Dominion Battery & Accumulator Co., Ltd.—Private company. Registered November 7th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of electrical storage batteries and accumulators, electricians, mechanical engineers, suppliers of electricity, &c. The subscribers are: V. Summers and E. Rudland, both of 2, Bond Court, Walbrook, E.C.4. The amount borrowed by the directors and outstanding shall not, without the sanction of a general meeting, exceed £1,000,000. Solicitors: Linkleters & Paines, 2, Bond Court, Walbrook, E.C.4.

E. C. & A. Ferguson, Ltd.—Private company. Registered November 2nd. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers, agents, suppliers and distributors of and dealers in electrical accessories of all kinds, &c. The directors are: E. C. Ferguson and C. W. Ferguson, both of Tefieleen, Oakleigh Avenue, N.20. Registered office: 54, Chiswell Street, E.C.1.

Etna Radio Manufacturing Co., Ltd.—Private company. Registered November 2nd. Capital, £100 in £1 shares. Objects: To carry on the business of electrical, wireless, television, mechanical and general engineers and engineering contractors and consultants, manufacturers of and dealers in radio, television, gramophone and telephone apparatus, &c. The subscribers are: H. L. Pattinson, Harwin, Ring Road, Moortown, Leeds, and R. J. Pattinson, 5, Woodland Grove, Newton Road, Leeds.

Jackson Bros. (London), Ltd.—Private company. Registered November 1st. Capital, £10,000 in £1 shares. Objects: To carry on the business of manufacturers of wireless apparatus and equipment, &c. The permanent governing directors are: L. E. Fillmore, "Brendon," Upper Elmers End Road, Beckenham; L. W. C. Fillmore, 80, Wickham Chase, West Wickham; and W. L. Fillmore, 477, Upper Elmers End Road, Beckenham. Registered office: 72, St. Thomas's Street, S.E.1.

Western Wholesale Wireless, Ltd.—Private company. Registered November 3rd. Capital, £500 in £1 shares. Objects: To carry on business as manufacturers of and dealers in accumulators and batteries, wireless sets, and components, &c. The first directors are: J. R. V. Webb, St. Ives, Bryn Road, Pontllanfraith, Mon., and H. T. Rake, Penrhiw, Blackwood, Mon. Solicitor: T. C. Griffiths, Blackwood, Mon.

Reacto Appliances, Ltd.—Private company. Registered November 1st. Capital, £1,000 in 1s. shares. Objects: To carry on the business of manufacturers, sellers and distributors of electrical and wireless apparatus and appliances, &c. The permanent directors are: L. W. H. Vignaux, "Castlecroft," Eaglesfield Road, Shooter's Hill, S.E.18; P. W. Millward, "San Remo," Meadway, Upminster, Essex; A. S. Bennett, 3, Victoria Terrace, Stroud Green, N.4; and W. S. Roberts, 148, Norbury Crescent, Norbury, S.W.16. Registered office: 28, Watling Street, E.C.4.

London Electrical Co. (Sherborne Lane), Ltd.—Private company. Registered November 3rd. Capital, £6,000 in £1 shares. Objects: To carry on the business of brokers, sellers, manufacturers, merchants, selling agents, exporters and importers of and wholesale and retail dealers in electrical apparatus, &c. The directors are: C. P. Hobson, "Brackenside," The Avenue, Tadworth, Surrey, and J. W. Hunwick, "Hazelmere," Rowbon Close, Totteridge, Herts. Registered office: 1, Sherborne Lane, E.C.4.

Returns of Electrical Companies

Macintosh Cable Co., Ltd.—Capital, £100,000 in 25,000 6 per cent. cumulative preference and 75,000 ordinary shares of £1. Return dated March 23rd, 1932. 23,997 preference and 51,008 ordinary shares taken up. £13,004 paid on 13,004 ordinary shares. £62,001 considered as paid on 38,004 ordinary and 23,997 preference shares. Mortgages and charges at date of return: £300,000 (£50,000 paid off August 15th, 1932).

Central Electric Supply Co., Ltd.—Satisfaction in full on August 26th, 1926, of charges to secure redeemable notes created by trust deed dated June 22nd, 1921, and Land Registry Charges dated July 1st, 1921, and May 9th, 1923, and registered July 23rd, 1921, July 21st, 1921, and May 29th, 1923. (Notice filed October 31st, 1932.)

Maidenhead Radio Service, Ltd.—The company's nominal capital has been increased by the addition of £500 beyond the registered capital of £1,000. The additional capital is divided into 500 7½ per cent. preference shares of £1 each.

Express Magneto (Repairs) & Electrical Co., Ltd.—Capital, £2,000 in 1,500 cum. preference and 500 ordinary shares of £1 each. Return dated September 24th, 1932. All shares taken up. £2,000 paid. Mortgages and charges at date of return: £950.

Johnson & Tanner, Ltd.—Capital £2,500 in 1,000 preference shares of £1 and 30,000 ordinary shares of 1s. each. Return dated May 16th, 1932. 1,000 preference and 25,000 ordinary shares taken up. £1,250 paid on 1,000 preference and 5,000 ordinary shares. £1,000 considered as paid on 20,000 ordinary shares. Mortgages and charges, £1,460.

New Radnor Electric, Ltd.—Capital £650 in £1 shares. Return dated May 3rd, 1932. 632 shares taken up. £600 paid. £32 considered as paid. Mortgages and charges, nil.

Austin Brothers Electrical Co., Ltd.—Capital £1,000 in 300 preference and 700 ordinary shares of £1 each. Return dated July 21st, 1932. All shares taken up. £700 paid. £300 considered as paid. Mortgages and charges, nil.

Acme Electric Lamp Co., Ltd.—Capital £1,000 in £1 shares. Return dated June 11th, 1932. All shares taken up. £2 paid. £998 considered as paid. Mortgages and charges, nil.

Bungay Gas & Electricity Co., Ltd.—Capital, £30,000 in £1 shares (15,000 preference and 15,000 ordinary). Return dated June 21st, 1932. 1,792 preference and 7,747 ordinary shares taken up. £4,213 paid on 1,792 preference and 2,421 ordinary. £5,326 considered as paid. 250 shares have been forfeited. Mortgages and charges, £8,450.

Tungsram Electric Lamp Works (Great Britain), Ltd.—Capital, £100 in £1 shares. Return dated October 12th, 1932. 10 shares taken up. £10 paid. Mortgages and charges, nil.

Whitchurch & Pangbourne Electric Supply Co., Ltd.—Capital, £10,000 in 300 preference and 1,700 ordinary shares of £5 each. Return dated June 28th, 1932. 1,700 ordinary shares taken up. £8,500 paid. Mortgages and charges, nil.

Nathan & Allen, Ltd.—Capital, £10,000 in £1 shares. Return dated June 2nd, 1932. 3,450 shares taken up. £1,100 paid. £2,350 considered as paid. Mortgages and charges, nil.

R. F. Winder, Ltd.—Capital, £12,000 in £1 shares. Return dated May 17th, 1932. 10,300 shares taken up. £10,300 paid. Mortgages and charges, nil.

Domestic Electrification, Ltd.—Capital, £50,000 in £1 shares. Return dated August 8th, 1932. 40,000 shares taken up. £40,000 paid. Mortgages and charges, nil.

Tisbury Electric Supply Co., Ltd.—Capital, £6,000 in £1 shares. Return dated May 18th, 1932. All shares taken up. £6,000 paid. Mortgages and charges, nil.

Mansfield & District Tramways, Ltd.—Capital, £180,000 in 80,000 preference and 100,000 ordinary shares of £1. Return dated August 4th, 1932. 80,000 preference and 44,834 ordinary shares taken up. £80,609 paid on 62,767 preference and 17,842 ordinary shares. £44,225 considered as paid on 17,233 preference and 26,992 ordinary shares. Mortgages and charges, £73,011.

Merthyr Electric Traction & Lighting Co., Ltd.—Capital, £100,000 in 6,000 preference and 14,000 ordinary shares of £5 each. Return dated May 12th, 1932. 6,000 preference and 13,000 ordinary shares taken up. £95,000 paid. Mortgages and charges, £49,038 9s. 6d.

Sheerness & District Electric Supply Co., Ltd.—Capital, £75,000 in £1 shares. Return dated May 12th, 1932. All shares taken up. £75,000 paid. Mortgages and charges, nil.

Yorkshire (Woollen District) Electric Tramways, Ltd.—Capital, £500,000 in 250,000 preference and 250,000 ordinary shares of £1 each. Return dated May 6th, 1932. 220,000 ordinary shares taken up. £220,000 paid. Mortgages and charges, £34,800 1st mortgage debentures issued to bankers as collateral security.

Beco, Ltd.—Debenture dated October 19th, to secure £1,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: H. A. Easter, 25/29, Lower Road, Rotherhithe, S.E.16.

Independent Battery Co., Ltd.—Satisfaction (1) to the extent of £200 on August 26th, 1932, of debenture dated April 13th, 1932, and registered April 20th, 1932, and (2) to the extent of £1,250, on same date of debenture dated April 14th, 1932, and registered April 20th, 1932.

Yorkshire Electric Transformer Co., Ltd.—Capital, £10,000 in 2,500 preference and 7,500 ordinary shares of £1. Return dated July 2nd, 1932. 600 preference and 4,630 ordinary shares taken up. £5,230 paid. Mortgages and charges, nil.

Peterhead Electricity Co., Ltd.—Capital, £5,000 in £1 shares. Return dated July 15th, 1932. All shares taken up. £5,000 paid. Mortgages and charges, nil.

C. T. Briscoe & Son, Ltd.—Capital, £5,000 in £1 shares. Return dated July 15th, 1932. 2,750 shares taken up. £860 paid. £1,890 considered as paid. Mortgages and charges: £1,148.

City Notes

Johnson & Phillips, Ltd., announce, according to statements appearing in the daily Press, that in view of the continued fall in turnover the directors have decided to await the full accounts of the year's trading before submitting their dividend recommendation. No interim dividend was paid last year, but 5 per cent. was distributed for the year. The directors state that the difficulty of obtaining business at remunerative prices, which was a feature of trading in 1931, still exists. They are satisfied, however, that the company is getting its fair share of the orders available. The contract placed with the company for the Mid-East England secondary lines for the Central Electricity Board has been completed, and an order has been obtained for the secondary lines for the South-West England section, work upon which is now beginning. The company has recently inaugurated a supply of electricity in a rural area in Sussex through its subsidiary, the Ringmer and District Electricity Co., Ltd. Other developments and extensions are in hand.

The British Electric Traction Co., Ltd., has declared an interim dividend of 2½ per cent. on the deferred ordinary stock. No interim was paid last year, but 5 per cent. was paid at the close of the year, together with a script bonus of 100 per cent. The interim dividends on the 6 per cent. preference and the 8 per cent. preferred ordinary are also announced.

Companies to be Struck Off the Register.—The names of the undermentioned companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary:—

British Curtis Radio, Ltd.
Dakol Electric, Ltd.
Norman Radio, Ltd.
Railway Radio Co., Ltd.
Skegness Electricity Supply Co., Ltd.

The North-Eastern Electric Supply Co., Ltd., is holding a meeting in Newcastle-on-Tyne on November 15th, when proposals will be submitted for increasing the capital of the company to £8,760,000 by the creation of 660,000 new ordinary shares of £1 each. In a circular to shareholders the company states that an issue is necessary in order to provide funds to meet expenditure on the company's business.

Siemens Bros. & Co., Ltd., are maintaining their interim ordinary dividend at 2½ per cent., less tax.

Stocks and Shares

TUESDAY EVENING.

THE successful conclusion to the Government's present programme of financing the national obligations has induced a somewhat unexpected complication into the market for gilt-edged securities. The rapid manner in which £300,000,000 of 3 per cent. stock was subscribed at 97½ demonstrated once more the abundance of money that seeks employment. On the other hand, investors are inclined to ask whether the fact of the Government having finished, for the time being, in the stock market may not mean a withdrawal of the factors which have made for pronounced monetary ease, and leave the market in gilt-edged stocks to find the level of yield which investment will be content to accept upon its capital. Therefore the market in British Government loans is showing an unwonted degree of vivacity in the violence of its fluctuations; showing, also, to what an extent speculation can run riot amongst the staidest stocks, and causing, incidentally, a certain degree of perturbation in the minds of stockholders unaccustomed to seeing the prices of their securities move so erratically as these have been doing of late.

The Investor's Complaint

On the first day of next month very substantial payments fall due to be made by the Government, though a great part of this money will become at once absorbed by the necessity of providing funds for the call on the newly issued 3 per cent. stock. It may be taken, therefore, for granted that one set of conditions will nearly neutralise the other. This being the case, the prices of best-class industrial shares give no indication of looking back from the high levels at which they now stand. In fact, the disposition is for quotations to move in the upward direction, because investors more and more complain that they cannot possibly afford to live on the income produced by British Government stocks. They are compelled, accordingly, to seek shares in the front rank of commercial undertakings in order to obtain anything like 5 per cent. on their money.

Reference to our own price lists will show how difficult this is, for in these catalogues are included a number of the best kind of industrial companies, whose ordinary shares are now the object of particular attention from the investor.

Cables and Wireless

After having subsided to some extent, the excitement in Cables & Wireless stocks suddenly flared up under the influence of a really considerable volume of buying which concentrated more particularly upon the 5½ per cent. preference. Dealers in the market profess to be unable to explain the sudden accession of strength, but rumour supplied a number of suggestions in place of anything definite. One report, so fantastic as to make it worth mentioning only as such, declared that a proposal is in contemplation for the setting up of an Authority, on the same lines as that of the Central Electricity Board, for dealing with wireless and cable communication. This would mean a quasi-official recognition of the stocks, and, however improbable the report sounds, it has played its part in serving to bring about a boomlet in the preference stock.

As a matter of interest, it may be noticed how the purchase of £100 of each of the trio in Cables & Wireless costs to-day something like £132 10s., whereas a few months ago the same amount, £100 of each stock, could have been picked up for something under £50.

Home Railways and Tramways

The Southern Railway ran its first electric train from Victoria to Brighton on the first day of the present month, a notable achievement, and one which will make the date historical in railway history. It is not proposed to open the electric system for through general traffic until the New Year. The carrying-over in Parliament of the London Passenger Transport Bill, as mentioned in last week's notes, is considered in the market to be the best way of dealing with this measure, as to the successful passage of which little doubt is entertained. The prevailing cheapness of money gives to Metropolitan consolidated stock an attractive appearance if it be taken for granted that the Bill will become law, because the new stock which it is proposed to issue in exchange will bear comparison with gilt-edged securities standing upon a lower range of income than is provided by Metropolitan Railway stock. A little interest is reviving in the shares of the London tramway companies, and prices are showing a tendency to advance. London United Tramways preference are being dealt in on the basis of 3s. 9d.; the company's 4 per cent. debenture stock retains its substantial rise of a week ago. London & Suburban ordinary are quoted about 1s. 3d. Metropolitan Electric Tramways are changing hands around a florin, and the company's 5 per cent. preference shares were recently negotiated between 7s. and 8s.

Manufacturing and Equipment

The constant plaint of the investor that he can get but a meagre return upon his money through the investment of his capital in British Government securities is exercising a strong force of compulsion in favour of ordinary shares in the front rank industrial undertakings. It is inevitable that investment should seek, and anxiously, such stocks and shares as will give, at any rate, 4½ to 5 per cent. on the money. In the demand for such issues, the shares of the electrical manufacturing and equipment companies are necessarily included. The market in these is decidedly hard; shares are more readily sold than they are purchased. It will be noticed that the yields on British Insulated, Callenders and Henleys are below 5 per cent. on the money. Enfield Cables ordinary, it is true, pay over 5 per cent., General Electrics give a little under 4 per cent. The investor, looking well ahead, anticipates the time when trade and industry shall revive to such an extent as will make large drafts upon money, for the purpose of its employment in manufacture and other branches of trade. Withdrawal of capital at present invested in gilt-edged securities would be the logical outcome of such demands, and, with expansion of trade, the profits of the industrial companies would benefit, to the increase of dividends and enhancement of capital value.

Capital and Trade

This, in brief, is a line of argument frequently heard nowadays in the City, and that it is being acted upon can be seen by the manner in which ordinary shares are going ahead. The strength of the gilt-edged market rests, of course, upon monetary conditions. In reply to the contention just outlined, the holder of trustee securities retorts that any marked improvement in trade is likely to be of so gradual a character as to render unnecessary the consideration of exchanging, at present, from his securities into shares of the ordinary class. But the accumulation of money is so constant and so considerable to enforce the daily search for industrials of the class mentioned.

Stocks on Offer

Taking this week a selection of the preference shares which are available in the market at the present time, 750 Clyde Valley 6 per cent. may be instanced as on offer at 29s. 6d. cum dividend, the dividend being due immediately. The yield on the money at this price is £4 1s. 3d. per cent., a meagre enough return, though the cover is exceptionally large. To pay the dividend on the shares takes £18,000 per annum, to meet which there was £318,000 available according to last year's accounts. Electrical Distribution of Yorkshire 6 per cent. preference can be bought a little more cheaply, there being 5,000 on offer at 28s. These return 4½ per cent., and the dividend, which takes £18,000, was covered 6½ times over, according to the latest figures. The next dividend is due in February, 1933, and will be approximately 6d. per share. Of General Electric 7½ per cent. "B" preference, there are 1,000 on offer at 33s., yielding 4½ per cent., and amply protected, according to last year's accounts, in the service of their dividend.

Of British Power & Light 6 per cent. preference, 1,000 can be bought at 24s. 9d., the return here being £4 17s. per cent., about the same, that is to say, as is offered by 2,500 British Thomson-Houston 7 per cent. preference, which can be obtained at 28s. 9d. For those who want a higher yield, it may be useful to mention that Ferranti 7 per cent. preference can be bought at 24s., to give £5 15s. 6d. per cent., and with dividends due in January and July. The dividend takes £35 000 per annum. In last year's accounts there was £70,900 available to meet it.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1930.	1931.	Price, Nov. 8	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	71/3	—	4 4 4
Brompton Ordinary	1	8½	8½	31/–	—	4 10 4
Central Electricity 4½% Deb.	Stock	4½	4½	104	–1	4 6 7
Charing Cross Ordinary	1	8½	8½	32/–	+6d.	4 7 6
Chelsea	1	8½	8½	32/–	+6d.	4 7 6
City of London	1	10	10	44/6	+9d.	4 8 0
Clyde Valley	1	8	7	32/–	+9d.	4 7 6
County of London	1	11	10½	51/3	+9d.	4 1 10
Edmundsons' 7% Pref.	1	7	7	30/–	+6d.	4 13 4
Elec. Dis. Yorkshire	1	9	9	41/3	—	4 7 4
Elec. Supply Corporation	1	11	11	55/–	—	4 0 0
Kensington Ordinary	1	8	8	32/6	—	4 6 1
Lancs. Light and Power	1	6½	7	28/9	—	4 17 5
London & Home Counties 4½% Deb.	Stock	4½	4½	107	—	4 4 1
London Electric	1	9	9	32/–	—	4 7 6
Metropolitan	1	10	10	48/9	—	4 2 0
Midland Counties	1	7	7	33/9	—	4 3 0
Mid. Elec. Power	1	8	8	35/9	—	4 9 5
North Eastern Electric Ordinary	1	6	6	28/–	+6d.	4 5 9
Do. 7% Pref.	1	7	7	31/–	—	4 10 4
Northampton	1	10	10	48/9	—	4 2 0
Notting Hill 6% Pref.	10	6	6	12½	—	4 16 0
North Met. Elec. 6% Pref.	1	6	6	29/6	+1/–	4 1 1
St James and Pall Mall	1	8	8	32/–	+1/–	4 7 6
Scottish Power	1	8	8	33/9	—	4 14 10
South London	1	8½	8½	31/6	+6d.	4 9 0
Urban Ordinary	1	7	7	33/9xd.	—6d.	4 3 3
Westminster Ordinary	1	8½	8½	32/–	+6d.	4 7 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	17/6	—	8 11 6
Yorkshire Elec.	1	8	8	40/–	—	4 0 0
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	82½	—	4 17 0
Metropolitan	„	3½	2½	61	—2	4 2 0
Do. District	„	5	4½	65½	+1	6 17 5
Underground Electric	1	8	7	19/6	+6d.	7 3 7
TELEGRAPH AND TELEPHONES.						
American Tel. & Tel.	$100	9	9	157½	—	5 14 3
Anglo-Am. Tel. Pref.	Stock	6	6	105½	+1	5 13 9
Do. Def.	„	1½	1½	26½	+½	5 13 2
Cables & Wireless 5½% Pref.	„	5½	2½	84½	+9	3 5 1
Do. A 7½% Ord.	„	—	Nil	32½	+3½	—
Do. B ord.	„	—	Nil	14½	+1	—
Globe Tel. and T. Ord.	10	8½	Nil	12½	+2½	—
Do. do. Pref.	10	6	6	11⅞	+⅛	5 1 1
Great Northern Tel.	10	20	20	28	+1	7 2 10
Marconi-Marine	1	15	10	32/6	+1/3	6 3 1
Oriental Telephone Ord.	1	12	12	2⅛	—	*4 1 8
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	—	—	5/–	—	—
Do. do. 2nd Pref.	5	—	—	3/9	—	—
Do. do. 5% Deb.	Stock	—	—	7	—	—
British Electric Traction Def. Ord.	„	5	5	300	—	—
Do. do. Pref. Ord.	„	8	8	135½	+2	5 18 0
Brazil Traction	100	—	—	13	+1	—
Brit. Columbia Elec. Rly. Pref.	Stock	5	5	102½	—	4 17 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	11/3	+1/3	—
London United Tram Deb.	Stock	4	4	67½	—	5 19 5
Mexico Trams, 5% Bonds	—	5	5	45	—	11 2 2
Mexican Light Common	100	Nil	Nil	12½	—	—
Do. 7% Pref.	100	7	7	20	—	—
Do. 1st Bonds	—	5	5	69½	—	7 11 10
Victoria Falls Ord.	1	15	15	78/9	—	3 16 2
Yorkshire (West Riding)	1	Nil	Nil	5/–	—	—
MANUFACTURING COMPANIES.						
Assoc. Elec. Ord.	1	6	4	17/6	—	4 11 5
Do. Pref.	1	8	8	30/–	—	5 6 8
Babcock & Wilcox	1	14	14	37/6	—2/–	—
British Aluminium Ord.	1	10	5	26/3	—	3 16 4
British Insulated Ord.	1	15	15	70/–	+2/6	4 5 9
Brush Ord.	Stock	5	Nil	35	—	—
Callender's	1	15	15	3⅛xd	+3/3	4 10 6
Do. 6½% Pref.	1	6½	6½	28/9	—	4 10 6
Crompton Parkinson Ord.	5/–	30	24	21/3	—	5 13 0
Do. 8% Pref.	1	8	8	30/–	—	5 6 8
Edison-Swan 1st Pref.	1	7½	7½	23/3	—	6 9 0
Do. 5% Deb.	Stock	5	5	100	—	5 0 0
Electric Construction	1	Nil	Nil	8/9	—	—
Enfield Cable Ord.	1	25	25	4½	+⅛	5 11 1
English Electric	1	Nil	Nil	10/9	—	—
Do. do. Pref.	1	Nil	Nil	13/9	—	—
Ever Ready	5/–	35	35	30/–	+6d.	5 16 8
Ferranti Pref.	1	7	7	23/6	—	5 19 2
G.E.C. Pref.	1	6½	6½	30/–	+1/–	4 6 8
Do. ord.	1	10	8	40/9	—	3 18 6
Henley's	1	30	30	6⅛	+⅛	4 17 5
Do. 4½ Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	3/9	—	—
Johnson & Phillips	1	10	5	1	—⅛	5 0 0
Siemens Ord.	1	7½	7½	26/3	—	5 14 3
Telegraph Construction	12	Nil	Nil	10½	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1931

9783. "Electric spark discharge systems." G. I. Finch, R. W. Sutton, and Ferranti, Ltd. March 31st, 1931. (381917.)

11425. "Magnetic means for controlling the electric arc of an electric arc lamp." J. O. Armstrong. April 17th, 1931. (381952.)

19126. "Processes for the manufacture of filaments for use as cathodes in thermionic valves." F. Hansgirg. November 19th, 1930. (381934.)

19669. "Electric suspension insulators." C. S. Garland. July 8th, 1931. (Cognate application 19670/31.) (381922.)

19967. "Electric motors." Lancashire Dynamo & Crypto, Ltd., and J. W. Howard. July 11th, 1931. (381957.)

19978. "Means for utilising the form factor of alternating currents for signalling or other systems." C. A. Beer. July 11th, 1931. (381940.)

20007. "Electroplating and the electrodeposition of metals." Mond Nickel Co., Ltd., and R. H. Atkinson. July 11th, 1931. (381931.)

20008. "Electrodeposition of palladium." Mond Nickel Co., Ltd., and A. R. Raper. July 11th, 1931. (381932.)

20102. "Electromagnetic relay arrangements employed in electrical signalling systems." Standard Telephones & Cables, Ltd., and B. B. Jacobsen. July 13th, 1931. (381946.)

20321. "Electrical signalling systems." L. E. Ryall. July 15th, 1931. (Cognate application 2049/32.) (381960.)

20326. "Diaphragms for reproducing sound." Electrical Research Products, Inc. July 15th, 1930. (381961.)

20522. "X-ray installation comprising a condenser acting as a source of current for the X-ray tube." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 17th, 1930. (381968.)

20831. "Electric switchgear." British Thomson-Houston Co., Ltd., and E. Regis. July 21st, 1931. (381977.)

22290. "Multicore electric cables used for communication purposes." Siemens Bros. & Co., Ltd., E. P. Elwin, and A. Rosen. August 6th, 1931. 381992.)

22403. "Automatic telephone systems." Siemens Bros. & Co., Ltd., W. H. Grinsted, and W. G. Patterson. August 7th, 1931. (381995.)

22418. "Prepayment electric meters." Siemens-Schuckertwerke Akt.-Ges. and R. Hornby & Co., Ltd. May 1st, 1931. (381996.)

22544. "Electric switchgear installations." Felten & Guilleaume Carlswerk Akt.-Ges. August 15th, 1930. (Patent of addition not granted.) (382000.)

22800. "Induction furnaces." Heraeus-Vacuumschmelze Akt.-Ges. and W. Rohn. August 28th, 1930. (382002.)

23568. "Anode grids for metal-vapour or rare-gas discharge rectifiers." Siemens-Schuckertwerke Akt.-Ges. August 23rd, 1930. (382008.)

23650. "Auxiliary lighting systems, such as spot-lamps, fog lamps, and the like, for motor road vehicles." Eversure Accessories, Ltd., and D. J. V. Venner. August 22nd, 1931. (382010.)

24577. "Sound reproduction from sound records and broadcast and other transmissions." Telefunken Ges. für Drahtlose Telegraphie. September 2nd, 1930. (382020.)

26349. "Mercury-vapour rectifiers." General Electric Co., Ltd., and E. Gallizia. September 21st, 1931. (382029.)

27436. "Luminous electric discharge tubes." General Electric Co., Ltd. October 27th, 1930. (Addition to 363092.) (382042.)

28154. "Automatic telephone system." General Electric Co., Ltd., and T. Hart. October 10th, 1931. (382051.)

28730. "Apparatus for use in electric spot-welding." R. D. Bell. October 16th, 1931. (382055.)

29016. "Superheterodyne wireless receivers." O. Wullenweber. October 19th, 1931. (382057.)

29386. "Electric heating plate." H. A. Plieger. October 22nd, 1931. (382062.)

29696. "Tools for severing the covering of electrical cables." Standard Radio Relay Services, Ltd., and G. M. O. Jenkins. October 26th, 1931. (382067.)

30226. "Electrical circuit tuning devices." G. V. Dowding. October 31st, 1931. (382076.)

30262. "Electric polarity testers." H. B. Prentice and W. Tindall. November 2nd, 1931. (382079.)

30354. "Electrical roll housings for rolling small sections." W. W. Triggs (Schloemann Akt.-Ges.). November 2nd, 1931. (382081.)

30443. "Induction furnaces." Heraeus-Vacuumschmelze Akt.-Ges. and W. Rohn. November 7th, 1930. (Addition to 382,002.) (382,082.)

31068. "Contact device serving for the production of electrical impulses for use in connection with measuring instruments, more especially electricity meters." Landis & Gyr Soc. Anon. November 11th, 1930. (381746.)

31388. "High-potential electric switches with protective casings." Siemens-Schuckertwerke Akt.-Ges. March 5th, 1931. (382090.)

31651. "Television reception means." M. Von Ardenne. November 17th, 1930. (381750.)

31913. "Electric cables." F. W. Maynard. November 18th, 1931. (Cognate application 14343/32.) (382093.)

32029. "Method for the production of sound-films." Siemens & Halske Akt.-Ges. December 19th, 1930. (382094.)

32243. "Electric cables for use on high (radio) frequencies." Telefunken Ges. für Drahtlose Telegraphie. November 22nd, 1930. (Patent of addition not granted.) (381754.)

32937. "Electron tube oscillator system." Wired Radio Inc. February 10th, 1931. (381761.)

33302. "Electric battery lamps." General Electric Co., Ltd., and F. C. Mayes. December 1st, 1931. (381765.)

33430. "Picture-telegraph, television, and like systems." Etablissements E. Belin. December 4th, 1930. (381768.)

35190. "Means for eliminating interference in electric signalling systems." J. Fuchs. December 19th, 1930. (381784.)

35207. "Transformers." Compagnie pour la Fabrication des Compteurs et Materiel d'Usines à Gaz. December 31st, 1930. (381785.)

35688. "Manufacture of telephone cables." Kabel und Metallwerke Neumayer Akt.-Ges. December 27th, 1930. (381788.)

1932

2477. "Connecting-up of wireless apparatus." Ideal Werke Akt.-Ges. für Drahtlose Telephonie. February 26th, 1931. (382149.)

3814. "Holders for electric lamps." S. S. Schreiber. February 9th, 1932. (382158.)

4472. "Microphones." W. R. Lane. February 15th, 1932. (382165.)

5393. "Portable electric routing machines." C. F. Moore & Sons, Ltd., and C. F. Moore. February 23rd, 1932. (382175.)

7056. "Electric switches with liquid immersed contacts." Siemens-Schuckertwerke Akt.-Ges. April 16th, 1931. (382193.)

3414. "Water-tight leg or gas-tight leg enclosed electric switches." R. H. Davis. March 21st, 1932. (382202.)

9117. "Construction of mirror drums for use in television, cinematograph picture transmission, or telecinematograph apparatus." Fernseh Akt.-Ges. March 31st, 1931. (382206.)

9825. "Single-phase induction motors." English Electric Co., Ltd., R. D. Bali, and L. Roberts. April 6th, 1932. (Patent of addition not granted.) (382209.)

11467. "Electrotherapic massage apparatus." J. Capo-Bianco. December 24th, 1931. (382221.)

12370. "Electric indicating devices." International General Electric Co., Inc. April 29th, 1931. (382228.)

12489. "Electric circuit cut-out device for use on road and other vehicles." C. E. Wise and D. W. Jenner. April 30th, 1932. (382229.)

12630. "Cathodes for thermionic tubes." B. Erber. May 2nd. 1932. (382230.)

12991. "Lamps for automobile vehicles." F. F. Boe. May 6th, 1931. (382231.)

15973. "Adjustable electric resistances." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 13th, 1931. (382248.)

20530. "Electric accumulators." Britannia Batteries, Ltd. March 17th. 1932. (Addition to 2107/31.) (381914.)

20965. "Electric contact devices." International General Electric Co., Inc. July 24th, 1931. (382260.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from November 2nd:—

Selmore. No. 534552. Class 6. Electric motors for advertising purposes and parts thereof.—Adkins & Philpott, Ltd., Windsor Works, Swan Close Road, Banbury.

Edibond. No. 532670. Class 8. Electric cables.—Edison Swan Cables, Ltd., 123-125, Queen Victoria Street, E.C.4.

Mars. No. 533755. Class 8. Radio-telephonic apparatus, radiogramophones, &c., and parts.—A. G. Clark, 43, Wellington Road, St. John's Wood, N.W.8.

Livaflex. No. 535021. All goods in Class 8.—Liverpool Electric Cable Co., Ltd., Bootle, Lancs.

Editor. No. 535055. All goods in Class 8.—Peto-Scott Co., Ltd., 77, City Road, E.C.1.

The Triumph. No. 528914. Class 13. Electric irons and kettles.—C. H. Twigg, trading as the Electric Domestic Appliance Co., 6, Kingstanding Road, Perry Barr, Birmingham.

Kappit. No. 530387. Class 16. Devices for connecting together the ends of electric wires and made principally of porcelain.—Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.

Parallel Resistances

A SIMPLE means of determining the resultant of resistances in parallel is provided by the use of a two-scale rule (one scale to slide over the other), which enables the reciprocals of the resistances to be added as fractions of the length of the rule and gives a direct reading of the reciprocal of the sum of the reciprocals.

The rule is so marked that the divisions of its length are represented by their reciprocals, i.e., ½ is shown as 2. Therefore, by adding the lengths marked by 2, 4 and 6 the proportion of the rule covered = ½+1/4+1/6 = 11/12. But the length 11/12 is also shown by its reciprocal, viz., 12/11 = 1.09, which is the resultant resistance of 2, 4 and 6 ohms in parallel. The length of the rule has been chosen to correspond with that of the 10-in. slide rule, and this has been found sufficiently accurate for all practical purposes, but the dimensions could be increased to ensure any degree of accuracy desired. The scale marked can be read as 0.1—40, 1—400, 10—4,000 100—40,000, etc., and the resultant of any number of parallel circuits can be ascertained.

Thus, if the resistances of four parallel circuits are 750, 375, 250, and 50 ohms: Using scales as 100—40,000, bring left end of one scale under 750 on top scale and read off over 375 on bottom scale, the resultant on top scale = 250 (note, this value need not be read if a cursor is employed); bring left-hand end of bottom scale under 250 on top scale and read off over 250 on bottom scale, the resultant on top scale = 125.

Using scales as 1—400, bring left-hand end of bottom scale under 125 on top scale and read over 50 on bottom scale, the resultant on top scale = 35.7; by calculation

$$\frac{1}{R} = \frac{1+2+3+15}{750} = \frac{21}{750} \text{ and } R = 35.7.$$

In the example given the figures taken are, for ease of illustration, multiples of each other, but the full benefit of the rule is found when, as in practice, the values to be dealt with do not bear this relation.—P. S. RIDD, M.I.E.E.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aldershot.—Electricity showrooms (£5,349); Building & Public Works Construction Co., Ltd., Swindon, builders.

Alfreton (DERBYSHIRE).—Houses (23), Riddings; U.D.C. surveyor.

Arnold.—Senior school (£15,300) and junior school (£5,000); Notts E.C.

Ashford (KENT).—Houses (50), Hampden Estate; A. F. Webster, U.D.C. surveyor.

Ashton (WIGAN).—Houses (60); U.D.C. surveyor.

Barnstaple.—Houses (32), Fair View site; borough surveyor.

Bathgate.—Church, Fauldhouse; Messrs. Roberts, architects.

Bexleyheath.—R.C. church, Heathfield Road; Rev. J. Malone.

Blackburn.—Central schools (£12,000) for the C.O.E. managers; Very Rev. J. Sinker. R.C. school, Brownhill; Rev. J. C. Gornall, Lisieux, Ramsgreave Road.

Blackpool.—School, Norbreck; F. Wood, borough engineer, Municipal Buildings, Sun-Ray Hotel (£750,000); J. Massey, architect, Sheffield.

Bromley (KENT).—Houses (113); C. H. Morrell.

Broughton (NORTHANTS).—Elementary school (£9,000); G. H. Lewis, county architect, County Hall, Northampton.

Chelmsford.—The John Henry Keene Memorial Homes (£25,000) at The Elms, Broomfield Road; Canon Morrow, chairman of trust.

Chester-le-Street (Co. DURHAM).—Houses (50), Pelton Fell; U.D.C. surveyor.

Christchurch (HANTS).—Houses (30); H. J. Farmer, borough surveyor.

Coundon (DURHAM).—R.C. church; R. Burke, architect, 12, Gray Street, Newcastle-on-Tyne.

Darlington.—Greyhound racing stadium, Chestnut Grove; J. Clayton, High Row Chambers.

Duns.—Housing scheme (20); town clerk, Castle Street.

Earsdon (NORTHUMBERLAND).—Houses (20), Holywell Village; T. W. Burgess, Council offices, Shiremoor, Northumberland.

Easington (DURHAM).—Houses (£44,336); Hayes & Gray, Wingate, Durham.

East Retford.—Court house; borough surveyor, Municipal Offices.

Edinburgh.—Houses (35), Craigentinny Estate; J. Miller, builder.

Elgin.—Houses (£10,000); borough surveyor.

Essex.—Technical college, Forest Road, Walthamstow; director of education, Chelmsford. Extensions, Sutton Institution (£325,355), for the P.A.C.; J. Stuart, county architect, Chelmsford.

Farnham.—Development, Hollow Oak Estate; J. Chuter.

Felling-on-Tyne.—Houses (128); C. W. Hall, architect, Council Offices.

Glasgow.—Houses (138), King's Park; Western Heritable Investment Co.

Great Yarmouth.—Dance hall, Britannia Pier; F. R. B. Haward, architect, 5, Queen Street.

Guildford.—Dog racing track; Guildford Greyhound Racing Co., Ltd., 39, Howard Road, Southampton.

Hamilton.—Re-erection of four-storey bakery, Woodside Walk, for Gilchrist, Ltd.

Hampshire.—Schools, Purbrook (£7,980), Hardley & South Hayling (£7,525); director of education, Winchester.

Hanley.—Houses (56); Taylor, Shaw & Bromley.

Harraton Colliery (Co. DURHAM).—Miners' hall and institute (£7,000); E. Graham, welfare supervisor, Coal Trade Offices, Newcastle.

Hartshorne and Seals.—Houses (50), with electrical work, for the R.D.C.; Goddard & Wain, architects, Station Chambers, High Street, Coalville.

Hastings.—Church, Sedlescombe Road; R.C. Diocese of Southwark. Houses (30), Belmont Estate, for J. H. Vine; Jeffery & Bowcock, architects. Houses (20), Bexleigh Avenue, St. Leonards, for Bexleigh Estates, Ltd.; H. H. Ford, architect.

Herne Bay.—Bank, Midland Bank, Ltd.; Ashford Builders Co., Ltd., 36, Bloomsbury Square, W.C.

Hertfordshire.—Elementary schools, Newgate Street Road, Hoddesdon and Watford; Herts E.C.

Hetton (DURHAM).—Houses (30), Broomhill Estate; J. Harding, Council surveyor.

Horbury.—Houses (28); W. Sugars, engineer and surveyor, Town Hall.

Hull.—Two cinemas, Hessle Road and Endyke Lane; City & Suburban Cinemas (Hull), Ltd.

Inverness.—Houses (100); borough surveyor.

Irish Free State.—(CORK).—Houses (58): J. H. Cronin, secretary, 25, St. Joseph's Drive, Montenotte Park. Hospitals (£121,000) for the Local Government Department. (DUBLIN).—Houses (261) for the Corporation. Electrically driven lift bridge (£20,000); Port and Docks Board, Customs House Docks. (ENNIS, Co. CLARE).—Houses (60); M. J. Carmody, town clerk, Town Hall, Ennis. (FERMOY, Co. CORK).—Houses (41); D. J. Buckley, architect, Elmvale, Mallow. (GALWAY).—Houses (45) for the U.D.C. (KILLARNEY).—Houses (46) for the U.D.C. (LIMERICK).—Technical schools (£7,823) for the County Vocational E.C. Houses (22); M. Doyle, builder, Newenham Street. Houses (300), King's Island Field, for the Corporation. (MONAGHAN).—Houses (42); Frank Gibney, architect, 16, Westmorland Street, Dublin. (MULLINGAR, Co. WESTMEATH).—Mental hospital extensions (£96,000); committee of management. (THURLES.)—Houses (38) for the U.D.C.

Isle of Man.—Grammar school, Ramsey, for the Education Authority; clerk, Douglas.

Kirkdale (YORKSHIRE).—Electric lighting installation at St. Hilda's Church, Nawton; Rev. J. Case, vicar.

Lancashire.—Schools, Fleetwood (£12,390) and Whitfield; County E.C.

Lanchester (DURHAM).—Houses (100); J. R. Lupton, U.D.C. surveyor.

Lincoln.—Houses (40), Boultham; S. C. Baggott, city engineer.

Lochgelly.—Houses (86); borough surveyor.

London.—(BARKING).—Battery manufacturing works; Chamberlain & Willows, factory agents, 23, Moorgate Street, E.C. (EDMONTON).—Cinema, Silver Street; Florida Cinemas, Ltd. (ISLINGTON).—Extensions, St. Mary's Hospital (£12,775); L.C.C. architect. (PADDINGTON).—Extensions to Poor Law Institution (£9,380); L.C.C. architect. (ST. PANCRAS).—Stadium, &c., Shoolbred site, Tottenham Court Road; J. S. Naylor, architect.

Longbenton (NORTHUMBERLAND).—Houses (50), Foresthall; J. Bean, surveyor.

Middlesbrough.—Model dairy (£25,000); C.W.S. Building Dept., West Blandford Street, Newcastle-on-Tyne.

Morecambe.—Methodist church, Seaborn Road; W. J. Morley and Sons.

Newcastle-on-Tyne.—Premises for H. Kelsey, Hanover Square, Newcastle; S. J. Stephenson, architect, 5, Saville Place. Houses (150), Scotswood Munition Cottages site, and 294 houses and bungalows, Stamfordham Road Estate; H. Roberts, architect to City Council.

Northfleet.—Houses (20), Mitchell Avenue; R. Hopkins and Sons.

North Shields.—Houses (24), Pineapple Estate; F. R. N. Haswell & Sons, architects, 77, Tyne Street.

Northumberland.—Houses (60); W. Dixon, architect, Collingwood Street, Newcastle-on-Tyne.

Norwich.—Methodist Church, Mile Cross Housing Estate (£6,500); secretary.

Perth.—Printing works for Thomas Hunter & Sons, Ltd., St. John's Place.

Plymouth.—Cinema, Exeter Street; Mexboro, Ltd.

Portsmouth.—Houses (20), Devon Road; G. Wallis.

Reading.—Telephone exchange, Caversham, for H.M. Office of Works, King Charles Street, S.W.1. Houses (200); borough surveyor.

Redhill.—Central hall, with cinema, for the Methodist trustees; George Baines & Son, architects, London.

Rochdale.—Extensions to Wolstenholme Hall (£18,900); Lancashire county architect.

Rotherham.—Infants' school; H. Herringthorpe, for the E.C.

Ryton-on-Tyne.—Houses (25); Newcombe & Newcombe, architects, 23, Eldon Square, Newcastle-on-Tyne.

Scunthorpe (LINCS).—Nurses' home (£13,000), for the War Memorial Hospital Board of Management; secretary.

Seaham Harbour.—School, Carr House Estate, for Durham County E.C.; F. Willey, architect, 34, Old Elvet, Durham.

Sheffield.—Houses (40), Loxley View; A. Ramsay.

Southport.—Extensions, including café, to Crown Hotel; Alderman Davies, architect, Liverpool.

South Shields.—Greyhound racing ground for the South Shields Greyhound Stadium, Ltd.

Staffordshire.—School, Leek (£5,443), for the County E.C.; Thomas Godwin & Son, builders, Hanley.

Stourbridge.—New Methodist Church at Gig Mill; S. A. Griffiths, architect, 87, High Street.

Sutton Coldfield.—Church; G. B. Cox, architect, 109, Calmore Row, Birmingham.

Thornaby-on-Tees.—Houses (100), Thornaby Grange Farm Estate; Handel Kay, borough surveyor.

Torquay.—Cinema, Market Street; S. G. Boultwood.

Tring.—Houses (24), New Mill, for the Workmen's Dwellings Association, Ltd.

Wakefield.—Municipal hospital (£70,000); C. H. Prince, builders, Benton Hill, Horbery.

Waltham Abbey.—Houses (62); U.D.C. surveyor.

Wealdstone.—School, Kenton; Middlesex E.C.

Weetslade (NORTHUMBERLAND).—Houses (20), Seatonburn; J. W. Braithwaite & Co., Whitefield Terrace, Newcastle.

West Hartlepool.—Houses (107); F. Craven, builder, 42, Stockton Street.

Woolwich.—Houses and flats (58 blocks), Middle Park Avenue Estate for B.C. (£120,640); borough engineer.

Workington.—Houses (60), Salterbeck Estate; borough engineer.

Worthing.—Vineries, with boiler house and heating work (£43,077), for Worthing Vineries, Ltd.; H. B. C. Baldwin, secretary, 9, North Street, Brighton.

Wrexham.—Houses (64); R.D.C. surveyor.

Electric Light on Trawlers

The Aberdeen trawler *Arona*, which was recently fitted with electric light, has completed its first trip. Every night the deck was brilliantly illuminated, not only saving the crew's time when handling the fish, but also reducing risk of accidents. During its eight days at sea the *Arona*'s bill for oil to operate its lighting plant was 10s. The cost of carbide for the old-fashioned acetylene lamps previously used would have been £2. It is calculated that the new plant will pay for itself within two years. The lighting plant used in the trawler consists of a 5-h.p. Lister-Diesel engine, radiator- and fan-cooled, direct coupled to a 100-V 2.5-kW compound-wound dynamo, all mounted on a cast-iron bedplate. The installation was designed and carried out by the electrical department of Messrs. Claud Hamilton, Ltd., in twelve working days. The owner of the trawler is so well satisfied with the result of the experiment that he has already decided to install a similar plant in one of his other vessels.